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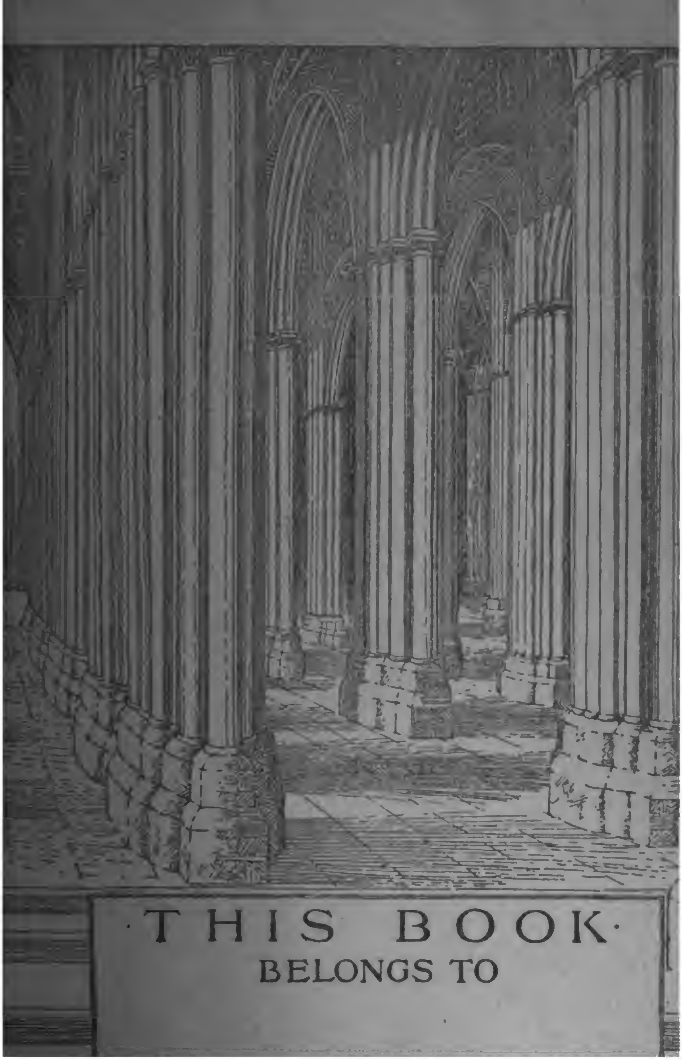
·THIS BOOK·
BELONGS TO

THE NEW

STUDENT'S REFERENCE WORK

FOR

TEACHERS, STUDENTS AND FAMILIES

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VOLUME V

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V

V (*vē*), the twenty-second letter, is a vocal consonant. Being made by the lips or by the upper teeth and lower lip, it is classed as a labiodental, as in *vain*, *vivid*, *lived*. Nearly every English word beginning with *v* comes from French or Latin. No English word ends with *v*, nor is *v* ever doubled. The Romans used V as a numeral (5) as well as a letter. Until recently words beginning with *u* or *v* were grouped together. *V* is more easily engraved than *U*, especially on stone.

Vacation Schools are the result of an extension of the public-school system in New York City, Chicago, Newark and other centers of population throughout the country. They originated in New York as a philanthropic experiment conducted by a private society. It was recognized by the city authorities that the success of the experiment was worthy of public recognition; and playgrounds and vacation schools were accordingly established in connection with the public-school system. The vacation schools of New York are administered by a district superintendent and a number of special directors under his supervision. In the vacation schools manual and artistic activities are exercised to a high degree. Music and dancing are provided for on roof-gardens where the open, fresh air may be enjoyed. There are even baths where swimming is taught. But the vacation school is by no means a place for recreation merely, unless the term recreation be extended so as to include many branches of useful work. In these vacation schools are taught basketry, benchwork, Venetian iron-work, chair-caning, carpentry, fret-sawing, whittling, work in burned wood and leather, sewing, embroidery, crocheting, millinery and domestic science. Often so much taste and ability are shown in one or another of these directions that a youth or girl finds his or her natural vocation through the vacation school. There are classes in the vacation schools even in the care of the sick, of the accidentally injured and of babies. Already there are indications in city tenement life that the art and culture disseminated by the vacation schools are entering into the lives of the people. Home conditions improve; and it is much, moreover, to give healthy and happy occupation to the youth who would else be subjected to the idle and vicious influences of the streets. In 1902 the schools cost the city $275,000; but the sum was applied to the maintenance of the evening recreation centers and afternoon playgrounds as well as the vacation schools properly so called. The latter essentially are summer institutions which meet for five mornings a week during a term of six weeks. The evening recreation centers, whose work is elsewhere described, are open during all the year. (See PLAYGROUNDS.) The afternoon playgrounds are open for systematic sports during two months of the school vacation. At the back of the movement for vacation schools is the feeling that, in large cities at least, the prolonged summer vacation is not without its mental and moral dangers, springing chiefly from lack of occupation.

The annual reports on vacation schools of New York, Chicago and other cities contain material of value to those interested.

Vaccination (*văk'sĭ-nā'shŭn*) is the process by which the disease termed *vaccinia* or cowpox, from the Latin word *vacca*, a cow, is introduced into the human system to protect it against the attack of the more severe disease of smallpox. In his *Inquiry into the Causes and Effects of the Variolæ Vaccinæ* Jenner, the discoverer of this remarkable remedy, establishes the following facts: (1) That this disease when communicated to man is a sure protection from smallpox; (2) that the cowpox alone, and not other eruptions affecting the cow, which might be confounded with it, has this power of protection; (3) that the cowpox may be communicated at will from the cow to man by the hand of the surgeon; and (4) that the cowpox once ingrafted on the human subject may be transferred from person to person, giving each one the same immunity from smallpox as was enjoyed by the person infected directly from the cow. See JENNER.

Vacuum (*văk'ū-ŭm*), the region in a closed vessel from which the air has been largely removed. To completely remove all gases from a closed vessel is impossible. To obtain a complete vacuum appears therefore to be a hopeless task. With an ordinary air-pump, in good working condition, one may produce a vacuum in which the pressure is not more than two or three millimeters of mercury. But by means of a mercury pump one may easily exhaust a vessel until its pressure is only one-millionth that of the atmosphere. If, however, elaborate precautions are taken with a Sprengel pump, a vacuum of only one hundred-

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millionth that of the atmosphere may be obtained. See AIR-PUMP, and read Kimball's *Physical Properties of Gases*, chap. v.

Valdai (*väl-dī'*) **Hills,** a range of hills in western Russia, midway between Petrograd and Moscow, 300 feet in height, but rising in Mount Popovagora to 1,080 feet. They extend about 250 miles; were formerly forested; but now are mostly cleared and cultivated. They form a watershed between the Volga, Dnieper and Düna.

Valen'cia, an ancient city and seaport of Spain and formerly its capital, stands on the shores of the Mediterranean, 300 miles by rail from Madrid. The Huerta, 35 square miles in extent, which surrounds the city, resembles an immense orchard, and is watered by an intricate network of pipes and rivulets laid down by the Moors 800 years ago and answering its purpose down to the present day. There are numerous picture-galleries in the city, in the chief of which only the productions of the great Valencian school are to be seen. There are a museum, a botanical garden and a fine old cathedral. The university, with its library of 50,000 volumes, has 39 professors and 1,728 students. The custom-house, dating from 1758, is now the cigar-factory, which employs more than 3,000 persons and produces 120,000 pounds of tobacco yearly. Valencia is connected with Madrid by rail, and is a famous summer resort of the more prosperous classes. Population 233,348.

Valencia, a town of Venezuela, South America, in the province of Carácas, two miles east of Lake Valencia. The city is situated in an exceedingly fertile district, in which cattle and horses are raised in great numbers. Population 38,654.

Val'entine, Basil, a celebrated German alchemist of whom so little is known that it is even disputed whether he lived in the 12th or in the 13th century. It has been maintained that he was a monk of the order of St. Benedict in St. Peter's convent at Erfurt; but his name does not appear on the Erfurt list nor on the general lists at Rome. His works were mostly written in the old Upper-Saxon dialect, and were not printed until 1602, after which many of them were published in the form of French translations.

Valentine or **Valenti'nus,** presbyter and martyr, according to the Roman legend, was arrested and thrown into chains at the instance of Emperor Claudius about 270 A. D. He was handed over to Calphurnius, who employed one Asterius to win him back to idolatry, but, instead of this, Asterius was won over to the Christian faith on account of the healing of his blind daughter by Valentine. The saint was kept in prison for a long time, but was finally beheaded. The custom of sending valentines is the survival of a practice connected with the worship of Juno on or about Feb. 14, and its association with this saint is purely accidental.

Valentin'ian I, emperor of the Western Roman empire from 364 to 375 A. D. As a military officer under Julian and Jovian he rose to a high position, and on the death of Jovian was chosen emperor by the officers of the army at Nicæa. Soon after this he named his brother Valens as his colleague, and the two brothers divided the empire between them, Valentinian, as emperor of the west, taking Italy, Illyricum, Spain, Britain, Gaul and Africa. During Valentinian's reign there were wars in Africa and Germany, and Rome also came into collision with peoples of whom we now hear for the first time — Burgundians, Saxons and Alemanni. The emperor's headquarters were at Treves during the greater portion of his reign. His general administration was wise and able and, in many respects, beneficent. Although hard and exacting in the collection of taxes from his people, the money was spent in defending and improving his dominions, and not in idle show or luxury. He died of apoplexy in 375, and was succeeded by Gratian and Valentian II, his sons.

Valentinian II, an infant four years of age, and his half-brother Gratian, a lad of 17, became joint emperors of the Western Roman empire in 375 A. D. They made Milan their residence, while the empire was at least nominally divided between them, Valentinian taking Italy and a part of Africa. Gratian died in 383, and four years later Maximus, who had commanded a Roman army in Britain, crossed the Alps into the valley of the Po and threatened Milan. The emperor and his mother Justina fled to Theodosius, emperor of the East, and besought his assistance, and in accordance with their request Theodosius marched into Italy with an army, defeated Maximus, and again set Valentinian on the throne. He was assassinated in 392 A. D.

Valentinian III, grandson of Theodosius the Great, was declared Emperor of the West in 425 A. D. His reign of 30 years was a period of great and terrible events, associated with the names of Attila, Genseric and Ætius, "the last of the Romans." Valentinian's usual residence was at Ravenna; but he fled to Rome in 452 on the approach of Attila, who, after ravaging Italy, died in the following year. In 454 Ætius, who had won the great victory over Attila at Chalons in 451, and who alone could have saved Rome from the destruction which hung over her, was treacherously murdered by Valentinian; and the next year the crime was avenged by the murder of the emperor himself while he was viewing some games in the Campus Martius. With the death of Valentinian the family of Theodosius became extinct.

Valentinus was the most important Christian theologian before Origen. He sought to combine the results of Greek philosophy with the doctrines of the Gospel, and treated the manifestation of Jesus as the keystone in the structure of thought which Greek science had reared. He may be regarded as superior to Philo in many respects and as having surpassed Origen in delicacy of perception and vigor of style, although he was far behind him in the extent of his learning. He came to Rome from Egypt about 138 A. D., and died about 160.

Valet'ta, an important fortress and beautiful city, capital of the island of Malta. The city was founded by John Parisot de la Valette, who so gallantly defended the island of Malta against the Turkish fleet in 1565. Alone and unsupported by any of the Christian powers, La Valette held the island under circumstances of great difficulty and distress; and at the end of four months the Turks were compelled to withdraw, after suffering a loss of several thousand men. The city contains many relics of the occupation by the Knights of Malta. Population 60,000. See MALTA.

Valhalla (*văl-hăl'lȧ*), in Scandinavian mythology, the "hall of the slain" — the abode of Odin in Asgard, the palace of Immortality, inhabited by the souls of heroes slain in battle. In the old Norse or Viking era, the *Eddas* relate, Odin and his chiefs dwelt in a sort of Olympus (Asgard) — the Norse Pantheon — which had two mansions, Gladsheim for the gods and Vingolf for the goddesses. There also was Walhalla, wherein Odin placed one half of the heroes slain in battle, the other half being received by Freja, the wife of Odin, who presided over smiling nature, sending sunshine, rain and harvest. The roof of Valhalla was resplendent with gold; spears, shields and armor adorned its walls. Out of this abode rode forth Valkyrs (or choosers of the slain) on invisible horses, to the battles of men on earth, and with their spears pointed out the heroes who should fall, whom they caught as they fell and bore to Valhalla in their arms. Troops of these invisible horsemen issued daily to engage in combat and return at night to be entertained with the never-ending hospitality of Odin. See the Norse prose *Edda*. Figuratively, Valhalla (or Walhalla) has come to mean a hall or temple adorned with statues and memorials of a nation's great ones, especially its soldier heroes.

Val'jean', Jean, the hero of *Les Misérables*, one of the best known and loved of the romances of Victor Hugo, is a former galley-slave whose life becomes changed through the goodness and kindness of a bishop. The bishop entertains Valjean, who escapes with the precious candlesticks of his host! Valjean is captured and brought back; but the bishop declares he has given him the candlesticks, and makes him a convert. Hereafter, Jean Valjean becomes the guardian of a beautiful girl, Cosette, to whom he devotes his life. The story of Jean Valjean is that love begets love and works miracles. "His whole heart melted in gratitude, and he loved more and more."

Valladolid (*văl'yȧ-thō-lĕth'*), a famous city of Spain, at one time capital of the whole country and still capital of the province of Valladolid, stands on the left bank of the Pisuerga, 150 miles northwest of Madrid by railway. It is 2,000 feet above the level of the sea, and has a healthful climate, the air being pure and genial and the sky generally cloudless. As Valladolid was the residence of the court prior to its removal to Madrid in the 16th century, it contains many large and decayed dwellings, although many new mansions have been erected and the streets have been paved enlarged and multiplied. There are a noted university, founded in 1346, a palace and an unfinished cathedral. Here Ferdinand and Isabella were married and here Columbus died. The city communicates with the Atlantic Ocean by the Douro and with various portions of Spain by canal and railway. Population 68,789.

Valladolid, a town of Mexico, in the state of Yucatan, 90 miles southeast of Merida, stands in the midst of a highly cultivated tract of country. It is the best-constructed and healthiest town in Yucatan, and is the seat of cotton manufactures. Population 14,000.

Vallejo (*văl-yā'hō*) Cal., a city in Solano County, at the mouth of Napa River, which empties into the northeast part of San Pablo Bay. Vallejo is connected by steamship lines with San Francisco (30 miles to the southwest); it is also reached by the Southern Pacific Railroad and an electric line. Adjacent to both is the Mare Island Navy-Yard (U. S.), which gives employment to about 2,500 men. There is also a quicksilver mine in the vicinity, while the region is a fertile one for farming and fruit-growing. In addition to lumber yards, planing-mills and fish-packing establishments, it has flour-mills, brick yards, a tannery, bottling works, a cement-works and carbonated water factories. It has a Sailor's Club house, a Home for Orphans, a Carnegie Library and the St. Vincent's Convent and school. Founded in 1851, the city was designed at one time as the capital of the state and here for a couple of years (1851-3) were held the annual sessions of the state legislature. Population, 14,000.

Valley Forge, Pa., a small village on the Schuylkill River, Chester County, 24 miles west of Philadelphia. The American army of about 11,000 encamped there on December 17, 1777, after the battles of Brandywine and Germantown. The place was chosen partly for its defensibility and partly to protect Congress, then in session at York, Pa. Many of the men died from exposure because of inadequate supplies. Here Baron Steuben disciplined and reorganized the army. From this camp Washington reoccupied Philadelphia in June of 1778. In 1893 Pennsylvania appropriated $25,000 towards making Valley Forge a state park, but the project was dropped because of the inadequacy of the fund.

Vallombro'sa, a celebrated abbey of Tuscany, situated among the Apennines in a valley surrounded with forests of fir, beech and chestnut trees. Here an Order of Benedictine monks was founded about the middle of the 11th century, who were called Vallombrosians from the name of the site. This monastery was suppressed in 1863, and its buildings used for a royal academy of forestry, but it is still much visited by artists and tourists.

Valois (*văl'wä'*), **House of,** a branch of the Capetian dynasty, which occupied the throne of France from 1328 to 1589, when it was succeeded by the house of Bourbon. It comprised the following princes: Philip VI, John the Good, Charles V, Charles VI, Charles VII, Louis XI, Charles VIII, Louis XII, Francis I, Henry II, Francis II, Charles IX, Henry III. (See articles under these titles.) The Valois monarchs of the early line generally were able rulers, who by valor and wise policy resisted the invasions of the English and firmly established the royal authority over their nobility; but those of the later lines, with the single exception of Francis I, were weak and feeble princes, under whose rule the country was distracted by contests between the nobles and by religious dissensions among the people at large, and only saved from greater calamities by the ability of the ministers of the crown, upon whom the government of the country devolved.

Valparaiso (*văl-pȧ-rī'sō*), the most important commercial town of Chile (*q. v.*) and chief port on the west coast of South America, is situated on Valparaiso Bay, on which it has a frontage of four and one half miles. It is 62 miles west from Santiago, with which it is connected by rail. It is also connected with the Transandine Railway, which will give connection with Buenos Ayres, Argentine Republic. Steamship lines connect the city directly with Europe and with Panama. Except for a narrow, level strip along the bay, the site consists of a series of hills from 300 to 1,000 feet in height. The city has handsome government buildings, fine hotel, office and business buildings, extensive wharves and warehouses, 12 parks, ten newspapers, professional and high schools, primary schools and extensive manufacturing establishments of various kinds. Valparaiso has been visited by destructive earthquakes at various times. The latest occurred in August, 1906, when the city was devastated, involving an appalling loss of life and a property loss estimated at $200,000,000. Population 175,000.

Valparaiso, Ind., county-seat of Porter County, 44 miles southeast of Chicago, Ill., is on the Fort Wayne, Grand Trunk and "Nickel Plate" railroads. It is in a fertile farming district, and trades largely in agricultural productions. The chief manufactures consist of dairy-products, machine-shop goods and mica-paint. The town has been made well-known by Northern Indiana Normal School. This was founded in 1874 by Henry Brown for those who can not avail themselves of courses in regular colleges. It has over 5,000 students of both sexes, who obtain board, lodging and higher education for about $125 a year. The secret of the low prices lies in the elimination of the middleman and the purchase of food in enormous quantities at wholesale rates. The college has seven acres of gardens cultivated mainly by the students, and these are housed almost as economically as they are fed. For 22 cents a day students obtain good lodging and excellent meals. From the profits on board, lodging and teaching this school has acquired 50 acres of land, bought or built nine substantial buildings, earned and saved nearly $1,000,000 and formed a faculty of 162 instructors. Common-sense ideas are put to use in the educational work. The institution has $200,000 of productive funds, and in 1907 its income was $295,000. There is a library of 12,000 volumes. The population of the city in 1910 was 6 987.

Vam'béry, Arminius, a distinguished Hungarian traveler and professor of Oriental languages at Budapest, was born in 1832. He has traveled widely in Persia and Central Asia, and published many works narrating his wanderings in Persia, in India, in Bokhara and in Central Asia. His more notable works are *History of Bokhara, The Central Asian Question, Story of Hungary, The Coming Struggle for India* and *Western Culture in Eastern Lands.*

Vam'pire, according to a superstitious belief, which still prevails in some European countries, a ghost which comes out of the grave at night and sucks the blood of men and women. In the mythology of the ancient Greeks beings of a similar nature existed, called the Lamias. These were beautiful women who allured youths to their embrace in order to feed on their flesh and blood. During the middle ages there was a prevailing belief that all persons who died under the ban of the church were sent forth by the devil at night to destroy other people; and it was thought that the only way to escape these vampires was by digging up their unwashed corpses and burying them.

Van, a fortified town and province of Turkey in Asia, stands near the southeast shore of Lake Van, 140 miles from Erzrum. It is overlooked by a citadel now much dilapidated, but which from its lofty height could easily be rendered almost impregnable. The principal public buildings, in addition to the citadel, are the mosques, the Armenian churches, the caravansaries and the bazaars. Van contains numerous ancient ruins, and cuneal inscriptions are found in which the name of Xerxes frequently occurs. Population 30,000. Lake Van is an inland sea, 80 miles in length and 50 miles in extreme breadth. It is fed by about eight streams, and has no visible outlet. Its waters are salt, and the only fish caught are a kind of sardines, which are salted and exported throughout Asia Minor.

MARTIN VAN BUREN

Van Bu'ren, Martin, eighth president of the United States, was born at Kinderhook, N. Y., Dec. 5, 1782. He commenced the practice of law at a very early age, and was elected to the New York state senate in 1812. After filling a number of other offices and taking an active part in the politics of the state, in 1821 he was chosen United States senator. He served a term of six years in that capacity, and was then chosen governor of New York. When General Jackson became president in 1829, Mr. Van Buren was appointed secretary of state, but he resigned the office in 1831 in order to accept the position of minister to England. This appointment being made during the recess of Congress, Mr. Van Buren proceeded to England, but as the senate refused to confirm the appointment he returned home soon after. This rejection by the senate probably caused his nomination and election to the office of vice-president in 1832, General Jackson being re-elected president at the same time. In 1836 he was elected president of the United States, receiving 170 electoral votes out of 283; but, although nominated for a second term by his party in 1840, he was overwhelmingly defeated by Gen. William Henry Harrison, the electoral vote standing for Harrison, 234; Van Buren, 60. Mr. Van Buren was brought before the Democratic national convention of 1844 as a candidate, but his nomination was prevented by the adoption of the rule requiring a vote of two thirds of the delegates to secure a nomination. In 1848 he was the candidate of the Free Soil party, but received no electoral votes. He died at Kinderhook, July 24, 1862.

Vancou'ver, Can., the largest city in British Columbia. It was founded by James Douglas in 1843. It is situated on Burrard Inlet, and is one of the best deep-water harbors on the Pacific coast. It is the western terminus of the Canadian Pacific Railway; also a terminus of the Seattle and Vancouver branch of the Great Northern Railway. Its population exceeds 60,000 and is rapidly increasing. Steamers for all ports, China, Japan etc., regularly leave Vancouver. Vancouver is destined to be a large city. It is a gateway of world-wide commerce. The first Canadian Pacific Railway steamer arrived at Vancouver from Yokohama in 1887. The surveys of the Canadian Pacific Railway which made Vancouver accessible were begun in 1871. A visitor to Vancouver, noticing wide streets and handsome structures, a score of chartered banks, with vessels from many lands in the harbor and business active everywhere, wonders at the change wrought in a single generation.

Vancouver Island, not the least important portion of British Columbia, which, from its great wealth of natural resources and its commanding position on the Pacific coast, is fast becoming one of the richest and most prosperous districts of the province. Coal-mining and lumbering are the chief industries, and fishing, quartz-mining, copper-smelting, ship-building, whaling and other branches are being rapidly developed. The Esquimault and Nanaimo Railway, running from Victoria to Wellington, serves a section of country which it will be difficult to surpass anywhere in the world for beauty of scenery and natural wealth. There are prosperous agricultural communities along the railway and in the Comox District, and several mines are being developed. There is quite a large area of agricultural land, which, where the thick forests have been cleared away, produces cereals of all kinds in abundance, as well as fruits. The climate, owing to the effect of the warm Japan Current (*q. v.*), is remarkably mild. The heaviest rains fall on the north and west coasts, owing to the combined effect of this current and the prevailing winds. The coal mines are on the east coast.

Vandals, a race of European barbarians who contributed very largely to the overthrow of the Roman empire. They made their first appearance as an historic people in the 2d century A. D., and in the first part of the 5th century, in company with the Suevi, Alani and other German tribes, invaded Gaul and ravaged and wasted it for three or more years. In 429 they crossed the Strait of Gibraltar, 50,000 to 80,000 strong under their leader Genseric, and carried devastation and ruin over northern Africa from the shores of the Atlantic to the frontiers of Cyrene. In 439 Genseric broke the peace which he had concluded with Valentinian III and conquered Carthage, when a new peace was concluded which recognized the authority of the Vandals over northern Africa and also over Sardinia, Corsica and part of Italy. In 455 the Vandals captured Rome and plundered it for several days. The manner in which they mutilated and destroyed the works of art collected in the city has caused the term vandalism to be applied to all similar acts of barbarity. After the death of Genseric his son, Hunneric, cruelly persecuted the orthodox Christians and kept the Mediterranean in almost constant alarm by his piracies. The Vandals continued to occupy northern Africa until 533, when the emperor, Justinian, sent an expedition against them under the great general, Belisarius, with the result that they were completely conquered, and their chieftain, Gelimer, was captured and carried to Constantinople in triumph. Most of the Vandals were then drafted into the Roman army and "used up" in the wars with Persia, the few who remained in Africa rapidly disappearing among the natives.

Van′derbilt, Cornelius (commonly called Commodore Vanderbilt), was born on Staten Island, N. Y., May 27, 1794. At the early age of 16 he showed signs of his genius and enterprise by running a boat of his own between New York and the island, and at 23 had accumulated nearly $10,000. In the year 1817 he associated himself with Thomas Gibbons in running the first steamer between New York and New Brunswick, N. J., serving as captain for several years. In 1829 he withdrew from the management of Gibbons' steamers, and for more than 20 years afterward built and operated steamers of his own from New York to various points, all of which proved very profitable. In 1851 he established a line from New York to San Francisco, which he sold to a company of which he himself became president two years later. During the Civil War he presented the government with his finest steamship, *The Vanderbilt*, which cost nearly $1,000,000, and about the close of the war withdrew his capital — amounting to many millions — from steamships and invested it in the stock of various railroads. He soon had control of the New York Central, the Harlem, the Erie and other roads, all of which he conducted with consummate ability and made more and more profitable. In 1873 he gave $1,000,000 to the endowment of Vanderbilt University at Nashville, Tenn., for the education of southern youth. He died at his home in New York, Jan. 4, 1877, having bequeathed the bulk of his estate to his son, William H. Vanderbilt.

Vanderbilt University, a coëducational institution founded in 1872 at Nashville, Tenn., as a Methodist college. The university received its present name in the following year, in honor of Cornelius Vanderbilt's gift of a million dollars to it, since supplemented by other monetary donations from members of the Vanderbilt family and by contributions from the Nashville citizens. In 1912, Andrew Carnegie gave one million dollars for the School of Medicine. It has a fine equipment in buildings, laboratories, etc., besides college-grounds 75 acres in extent. The university prepares for the bachelor's degree in arts, divinity, law, engineering and science; for the M. A. degree in arts, science and pharmacy; and for the doctor's degree in medicine and dental surgery; besides courses with degrees in civil, mechanical engineering. Its teaching staff, with the faculty, numbers 125; while in 1915 it had an attendance of 960 students. It is one of the best of the southern universities.

Vanderlyn (*văn′dẽr-lĭn*), **John**, an American painter, was born at Kingston, N. Y., Oct. 15, 1776, and, after taking lessons in painting from Gilbert Stuart, visited Paris at the age of 20 and studied his art in that city for a number of years. He returned home in 1801, but in 1803 made another journey to Europe, where he remained till 1815. Among his works executed while in Europe were *The Murder of Jane McCrea by the Indians* and *Marius sitting among the Ruins of Carthage*. His *Landing of Columbus* can be seen in the rotunda of the national capitol, and his portrait of *Washington* in the hall of the house of representatives. He died at Kingston, N. Y., Sept. 23, 1852.

Van Die′men's Land. See TASMAN′IA.

Van Dyke or **Van Dyck, Sir Anthony,** was born at Antwerp, March 22, 1599. It is said that his talent for painting was fostered by his mother, who painted landscapes and was highly

SIR ANTHONY VAN DYKE

skilled in embroidery. After making considerable progress under Van Balen, he became a pupil of Rubens at the age of 16, who was not slow to discover his remarkable genius. In 1621, by advice of Rubens he visited Italy, remaining there five years. In 1632 he came to England on the invitation of the earl of Arundel, where a pension of $1,000 a year was settled on him. He died at London in 1641, leaving property to the amount of $100,000. It was only 20 years from the time when Van Dyke left the studio of Rubens until his death; and in that short period nearly 1,000 pictures of various kinds were executed by him. His best known works are representations of the crucifixion.

Van Dyke, Henry Jackson, D.D., LL.D., American author and preacher, was born at Germantown, Pa., Nov. 10, 1852, and graduated at the Brooklyn Polytechnic Institution, and Princeton College and Theological Seminary. After taking a post-graduate course at Berlin University, he entered the ministry and held the charges successively of the United Congregational church at Newport, R. I., and of the Brick Presbyterian church, New York. The latter charge he resigned in 1899, to accept the Murray chair of English literature at Princeton University. In 1889 he was appointed preacher to Harvard University, and in 1893 delivered the Lyman Beecher lectures on preaching at Yale. He also delivered a memorial ode at the 150th anniversary of Princeton University, of which he is a trustee. He has been a contributor to many of the contemporary magazines, and taken active part in religious work among the colleges. His writings embrace *The Poetry of Tennyson*, *The Reality of Religion*, *The Story of the Psalms*, *The Christ-Child in Art*, *The Gospel for an Age of Doubt*, *Straight Sermons to Young Men*, *The Ruling Passion* and *The School of Life*.

Van Hise, Charles Richard, American geologist and author, was born at Fulton, Wis., on May 29, 1857. He studied at the University of Wisconsin, and in 1879 graduated, after which he became a member of the faculty, acting first as instructor in chemistry and metallurgy, then as professor of metallurgy and petrology, and finally was elected president of the institution. While acting in the latter capacity, he accepted the post of non-resident professor of structural geology in the University of Chicago, and later served as assistant on the Wisconsin State geological survey and subsequently became consulting geologist to the survey. He was also a member of the United States Geological Survey, and took charge, in 1888, of its operations in the Lake Superior district. Two years later he was appointed geologist in charge of the division of the archæan and metamorphic rocks of the United States. He has been made honorary member of a number of foreign scientific societies. During the European War he prepared a two-volume course of study on food conservation issued by the government. His published works embrace *Principles of North American Pre-Cambrian Geology*, *Some Principles Controlling the Deposition of Ores*, *A Treatise on Metamorphism* and *Concentration and Control*, dealing with trusts. He died Nov. 19, 1918.

Van Horne, Sir Wm. Cornelius, K. C. M. G., president of the Canadian Pacific Railroad since 1888, was born in Will County, Ill., Feb. 3, 1843, and entered railway service in 1857. After filling various junior posts, he rose to be general superintendent of the Chicago and Alton and subsequently of the Chicago, Milwaukee and St. Paul Railroad. In 1884 he became general manager of the Canadian Pacific Railroad, and in 1888 was elected to the presidency. He was knighted in 1894. He died Sept. 11, 1915.

Vanil'la, the generic as well as the common name of plants which yield the aromatic extract of commerce. The genus is a member of the orchid family, and is native to Mexico and Brazil, and is cultivated in various tropical countries. The aromatic extract is obtained from the long pods, known as vanilla beans, and their seeds.

VANILLA

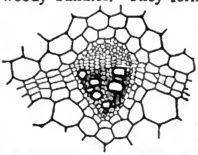
Van Rensselaer (*vǎn rěn' se - lẽr*), **Stephen,** known as "the Patroon," an American statesman, was born at New York, Nov. 1, 1765. He was educated at Princeton and Harvard Colleges, and married a daughter of Gen. Philip Schuyler, a distinguished officer of the Revolutionary War. He early gave his attention to politics, and in 1795 was elected to the New York legislature, afterwards becoming lieutenant-governor and canal commissioner. At the beginning of the War of 1812 he was in command of the state militia, and led the assault on Queenston; but the refusal of a portion of his troops to cross the Niagara River enabled the British to repel the attack, and Van Rensselaer retired from the service in disgust. At his own cost he employed Professors Eaton and Hitchcock to make geological surveys of a large portion of New York and New England; he also employed Professor Eaton to deliver geological lectures throughout the state. In 1824 he established an institution at Troy for the education of teachers, with free pupils from every county in the state. About this time also he entered the lower house of Congress, and served several terms in that body with honor and distinction. He died at Albany, N. Y., Jan. 26, 1839.

Vane, Sir **Henry,** was born at London in 1612, and was educated at Oxford, where he appears to have embraced the republican principles for which he became so famous. His travels in France and Switzerland strongly confirmed him in his opposition to the Church of England; and in 1635 he sailed for New England — the refuge of freedom-loving spirits in those days. He was chosen governor of Massachusetts, but his supposed heretical opinions soon destroyed his popularity among the Puritan settlers, and after a residence of a year or two in the new colony he returned home and entered upon a political career. When the war between Charles I and Parliament broke out, no man was more active among the leaders of Parliament than Vane. In 1646 Vane was one of the English commissioners for the preservation of peace with Scotland, and in 1648 was appointed to negotiate with Charles I at the Isle of Wight. But he did not view with satisfaction the increasing power of Cromwell and the army, and was strongly opposed to the execution of the king. His views as to the rights and powers of Parliament brought him into pretty sharp conflict with Cromwell, who is said to have exclaimed, when he dissolved his Parliament in 1653: "The Lord deliver me from Sir Harry Vane!" When the restoration of Charles II took place, Vane was one of the 20 persons exempted from the act of general amnesty; and in July, 1660, he was arrested and committed to the Tower. Two years later he was brought to trial at London, and, although he defended himself with great ability and eloquence he was found guilty and condemned to death. In response to a petition that Vane's life should be spared, Charles wrote to Clarendon, declaring that he is "too dangerous a man to let live, if we can honestly put him out of the way." He was accordingly beheaded on June 14, 1662.

Var'nish, a solution of some resinous material in any proper solvent, alcohol and oils being the ones chiefly employed. The solution must be of such a consistency as to be thinly and smoothly spread over the surface intended to be varnished, so that, when it dries, it will leave a thin, resinous coating, which is either glossy or can be made so by mechanical polishing.

Var'ro, Mar'cus Terentius, "the most learned of the Romans," was born at the Sabine town of Reate in 116 B. C., and received his education first under Præconinus and then under Antiochus, a philosopher of the Academy. He served with distinction against Mithradates, king of Pontus, and also against the Mediterranean pirates, but afterwards, as legate of Pompey in Spain, he was compelled to surrender his forces to Julius Cæsar. He continued to share the fortunes of Pompey till after his defeat at Pharsalia, when he was pardoned by Cæsar and employed by him to collect and arrange the great library designed for the public. When the second triumvirate was formed by Antony, Lepidus and Octavian, his name was on the list of the proscribed, but, after some time spent in concealment, he was received under the protection of Octavian, and the remainder of his life was spent in the prosecution of his studies. He died in 28 B. C. Varro was not only the most learned of the Romans, but the most prolific Roman author. He himself confesses to have written no less than 490 books; but only two have survived, and one of these only in a fragmentary state.

Vasari, Giorgio (*jōr'jō vä-zä'rē*), an Italian architect, painter and writer, was born in Tuscany in 1511, and died at Florence in 1574. He studied under Signorelli, Michael Angelo and Sarto. He had great architectural ability, and his Arezzo church and Uffizzi palace stand beside the best buildings of their time. His paintings, however, have every fault of the late Florentine style. His *Lives of Painters, Sculptors and Architects* have great value and singular charm, though he made many mistakes about the earlier artists and perhaps was prejudiced in favor of his fellow-Tuscans. The work has frequently been translated and is delightful reading.



A COLLATERAL VASCULAR BUNDLE

Vas'cular Bundles (in plants), often called woody bundles. They form the great conducting systems of fern-plants and seed-plants, by means of which water with whatever it contains in solution passes from the roots which absorb it to the leaves which use it; and by which elaborated materials pass to points of use and storage. The movement of water from roots to leaves is commonly spoken of as the ascent of sap (but see WATER, ASCENT OF). This great conducting system, composed of vascular bundles, is found only in fern-plants and seed-plants, which are often called vascular plants to distinguish them from moss-plants and thallus-plants, which do not possess vascular bundles. Each bundle consists of two distinct regions: (1) xylem or wood, that which contains the tracheæ or tracheids (see both); and (2) phloem or bast, that which contains the sieve-vessels (*q. v.*). The xylem is concerned in the water conduction and the phloem in food conduction. In an ordinary tree the whole wood-mass is an aggregate of xylem tissue, while the fibrous inner bark is the phloem tissue (see Bark). Different types of bundles are distinguished by the arrangement of their xylem and phloem masses with reference to one another. Those bundles, in which the xylem and phloem lie side by side on the same radius, the phloem always being on the outside, are called collateral bundles, and are characteristic of the stems of seed-plants. Those in which the xylem is completely surrounded by the phloem are concentric bundles, and are characteristic of the stems of fern-plants. Those in which the xylem and phloem alternate with each other around a common center are radial bundles and are characteristic of all roots.

Vases form a very ancient class of vessels, used formerly for domestic purposes but now chiefly for ornamentation. Usually they are circular in shape, have one or two handles, and are hollow within, and variously decorated without. In architecture, however, vases need not be hollow. The ancient Greek vases found in catacombs throughout Sicily, southern Italy and Greece were used to receive the ashes of the dead. Such vases are usually of pottery, though some have been found of metal, ivory and bronze. The study of ancient terra-cotta vases has shed a great deal of light upon Greek and Roman life; but unfortunately the Egyptian vases are upon the whole of little interest, perhaps because good clay was so abundant in Egypt that it cheapened the art of pottery. The oldest Greek vases are marked by geometrical patterns. At a later stage plants and animals are used in decoration. A finer clay and a more lustrous pigment indicate the progress of the art. The greatest masters of pottery were the Athenians, who in the 6th century B. C. invented a brilliant black glaze, used for figures upon a red ground. At a later stage the Athenians frequently depicted red figures upon a black ground. A period of decadence in the potter's art appears to have begun in Athens as early as the fourth century B. C. The vases of Sicily and southern Italy were more gay and less classic than those of Athens.

Among the Greek vases the type best known perhaps is the *amphora*, in which oil and wine were kept. The *pithos* was a large and comparatively coarse vase for grain or the cheaper fluids. The *hydra* was a water-pitcher which possessed an extra handle for pouring. The *crater* was a bowl from which wine was served to the company at table. The *cylix* is a very shallow, broad cup. The figures upon these and other Græco-Roman vases reveal to the modern observer scenes from the myths, the industries, the festivals, the ceremonies and the sports of ancient life. The Portland (*q. v.*) vase in the British Museum is one of the most famous examples. The workmanship of this vase is peculiar, for it is constructed of two layers of glass, of which the outer and opaque layer is cut down in such a way that figures are left standing, cameo-fashion, upon the inner layer as a ground. See Pottery.

Vas'sar College, founded by Matthew Vassar, the first well-equipped institution for the higher education of women, is two miles east of Poughkeepsie, N. Y. It was incorporated in 1861 and opened in 1865. In the same year Mr. Vassar transferred to the trustees a farm of 200 acres, on which the college was to be built, and other property, the whole amounting to $400,000 in value. He increased this sum by other large gifts during his lifetime, and on his death bequeathed $400,000 more. It has also been pecuniarily aided by Mr. Vassar's nephews In accordance with the wish of Mr. Vassar some of the instructors are men and some are women. The buildings are the main building, modeled after the Tuileries, observatory, laboratory, museum, conservatory, gate-lodge, gas-works, boiler and pump houses and farm-buildings. The library contains 60,000 volumes, and the gymnasium, observatory and laboratory are finely equipped, while the conservatory was added for assistance in the study of botany. It has also a collection of paintings and casts of models. There are 210 acres in the grounds, forming a beautiful park, with a lake for boating and skating. Besides the regular course for the degree of A. B., admission to which requires the same examinations as entrance to the leading colleges, there are schools of painting and music. In 1910 there were 104 instructors and 1,058 students; and the college is steadily growing in size and in influence. To-day its annual income is close upon $490,000; while the amount of its productive funds is $1,312,600. The value of its chief buildings and residences at present exceeds two million dollars. The college offers its students four fellowships, six or seven graduate scholarships, besides a number of undergraduate scholarships.

Vassar, Matthew, American philanthropist and founder of Vassar College, was born in Norfolk County, England, April 29, 1792, and four years later accompanied his father to America, where he settled on a farm near Poughkeepsie, N. Y., his father establishing a brewery in that city. Young Vassar subsequently succeeding his father in this interest, he decided in 1845 to apply a portion of the profits derived from it to the endowment of a school for the higher education of women. This purpose he put into effect in 1861, by donating $400,000 to the institution in Poughkeepsie that became known as Vassar College. The success of the institution was gratifying and immediate. On Matthew Vassar's death in June, 1868, he provided in his will for a further donation of $400,000 to Vassar. The institution has been since enriched by large sums donated to it by the nephews of Matthew Vassar, and to the endowing of memorial chairs, aiding the Literary and Scientific institute attached to the college, to Vassar Brothers' Hospital and to the Home for Aged Men in Poughkeepsie.

Vatican (*văt'ĭ-kăn*), the residence of the pope and the seat of the great library, museums and collections of art, ancient and modern, which constitute one of the chief attactions of Rome for all visitors. Although the earlier popes had a residence in the Vatican, it is probable that no part of the present edifice is older than the pontificate of Nicholas V, who in the 15th century began the plan of improvement and embellishment of the Vatican which has made it the noblest of princely residences. Alexander VI, Julius II and, above all, Leo X pursued the same plan; and nearly all the succeeding popes have had some share in the enlarging of the building. Amid all the difficulties, financial and political, of his pontificate Pius IX made numerous improvements to the palace, the most striking being the great stair by which it is approached from the colonnade of St. Peter's. The building with its garden and appurtenances is said to cover a space equal to the whole area of the city of Turin, such as it was 30 years ago, with its 130,000 inhabitants. It contains several thousand separate rooms or apartments, some of them of unrivaled beauty and elegance. Among these may be specially mentioned the chapel of San Lorenzo, the Pauline chapel, the Sistine chapel, decorated in frescoes from the brush of Michael Angelo, the galleries and halls decorated by Raphael, Giulio Romano and their scholars, the magnificent library, the galleries of antiquities, Christian and pagan, and of paintings, statuary, bronzes, medals, vases and other objects of art.

Vatican, Council of the, the great ecumenical council of the Roman Catholic church in 1869-70, at which the doctrine of papal infallibility was formally promulgated. This council, composed of Roman Catholic prelates — some 750 in number — from all parts of the world, convened in the Vatican palace on Dec. 8, 1869, and closed its deliberations on Oct. 20, 1870, when this dogma was adopted by a practically unanimous vote. As formulated at the council, it contains the following propositions: (1) That a proper primacy or jurisdiction over the whole church was conferred on St. Peter directly, and not mediately through any delegation authorized by the church as a whole; (2) that this primacy rests by divine institution in the line of Roman pontiffs as St. Peter's successors; (3) that the pope's jurisdiction is immediate in all churches, all other bishops being merely his curates and deputies; so that not only on questions of faith and morals, but on questions of discipline and order the entire church, both priests and laymen, are bound to submit to his authority; (4) that it is unlawful to appeal from the pope to an ecumenical council as a higher authority; (5) that the pope, when he speaks *officially* and defines a doctrine of faith or morals to be held by the universal church, is infallible, and his utterances are not to be modified or changed.

Vaudois (*vō'dwä'*). See WALDEN'SES.

Vaughan (*vawn* or *vau'un*), **Herbert,** Cardinal, English Roman Catholic prelate and the successor of Cardinal Manning as archbishop of Westminster, was born at Gloucester, England, April 15, 1832, and received his education at Stonyhurst College and at Rome. He was ordained a priest at Lucca in 1854, and returning to England he joined the Oblates of St. Charles at Bayswater. He then became vice-president of St. Edmund's College near Ware, and in 1869 founded and became president of St. Joseph's Foreign Missionary College, Middlesex, and three years later accompanied to Maryland a detachment of priests on a special mission to the colored people of the United States. In 1872 he was consecrated to the bishopric of Salford, and 20 years later was transferred to the see of Westminster. In 1893 he was created a cardinal of Rome, and two years later he laid the foundation stone of Westminster (R. C.) Cathedral, a vast and stately edifice in the Byzantine style, erected in London. When he died, June 19, 1903, the building was so far complete that requiem mass was said there over his body. (See LIFE, by J. G. Snead.)

Vault, an arched roof, usually constructed of stone or brickwork. The simplest kind of vault is the semicircular arch extending from one end of an apartment to the other. Ordinary bridges are an example of this style of vaulting, which was commonly used by the Romans, who also built vaults with groins, that is, vaults intersecting one another. The Egyptians are also said to have been acquainted with vaulting; but the earliest remains of ancient vaults of any magnitude are among the Romans. The Roman vaults, when groined, were usually constructed with carefully cut stone, so as to prevent the angle from chipping; but the medieval architects had not the costly materials or skill of the Romans at command; so they formed only the groins of dressed stone, and filled in the vault with more common material. This led to the groins becoming a prominent feature in medieval architecture, moldings and carvings being used for ornamentation. In modern architecture vaults and arches are gradually being superseded by the use of iron constructions, both for roofs and for supporting floors, bridges etc.

Vauxhall (*vâks-hâl′*), a famous public garden in London, established immediately after the Restoration in 1660 and continuing for nearly two centuries. It was situated in Lambeth, opposite Milbank and near the manor called Fulke's Hall, from which it derived the name of Vauxhall. The loose character of the amusements it afforded is freely sketched by the novelists and dramatists of the last century, and is further sketched in Thackeray's *Vanity Fair*.

Vec′tor is a term employed by mathematicians to denote a directed magnitude, that is, a quantity which has both direction and magnitude.

As examples of vector quantities may be mentioned the distance between any two given points, a velocity, a force, an acceleration, angular velocity, intensity of magnetization flux of heat.

Quantities, such as a quart of water, a pound of sugar, temperature, a quantity of energy, which do not have direction, are called *scalars*. See Maxwell's *Matter and Motion* and Tait's *Newton's Laws of Motion*.

Veda (*vā′dȧ* or *vē′dȧ*), (literally, *knowledge*) is the name of those ancient Sanskrit works on which the first period of the religious belief of the Hindus is based. The oldest of these works is the *Rigveda;* next to it stand the *Yajurveda* and *Samaveda;* the fourth and latest being the *Atharvaveda*. The first three bear the collective title of *Trayi*, the threefold, and all four are considered of divine origin. Each of these Vedas consists of two distinct divisions — a *Sanhita* or collection of *mantras* or hymns and a portion called *Brahmana* A *mantra* may be defined as a prayer or thanksgiving addressed to a deity in one form or another. If such a *mantra* is metrical and intended for loud recitation, it is called *rich*, from *rich*, praise — whence the name *Rigveda;* if it is in prose it is called *Yajus*, from *yaj*, sacrifice, — therefore *Yajurveda* signifies the Veda containing such sacrifices. And if it is metrical and intended for chanting, it is termed *Saman* — hence *Samaveda* means the Veda containing such *Samans*. No special name is given to the *mantras* of the fourth Veda. Though the *mantras* and *Brahmanas* are both said to have existed from all eternity, there is abundant evidence that the *Brahmana* portion of each Veda was written some time after its *mantras*, for it refers to them, and it seems almost self-evident that both portions must have been the work of considerable time.

Ved′der, Eli′hu, an American painter, was born at New York City Feb. 26, 1836, and after studying his art for some years both with Matteson and in Europe, opened a studio in his native city, where he won high reputation as a *genre* painter. He afterwards returned to Europe and took up his residence at Rome, where he is now living. Among the pictures which rank him high as an artist may be mentioned *The Lair of the Sea-Serpent*, *The Monk upon the Gloomy Path*, *African Sentinel* and *The Last Sun-Worshipper*.

Vega-Carpio (*vā′gȧ kär′pē-ō*), **Lopé Felix de,** a celebrated Spanish poet, was born at Madrid, Nov. 25, 1562. From his infancy he is said to have given promise of extraordinary talent. Like Pope he "lisped in numbers." He was the idol of his time, and in productiveness at least surpassed all other poets, his dramas alone numbering 1,500 to 1,800, and in view of the quantity of his work its quality is no less surprising. The ease and grace of his versification are unsurpassed in the Spanish language, and his works are all instinct with life and dramatic movement. He is deficient in deep and serious qualities; but, notwithstanding this defect, he remains the chief ornament of the Spanish drama and a considerable figure in the dramatic literature of the world. The dramatist is generally referred to as Lope de Vega. He died at the home of his birth, Aug. 27, 1635.

Veii (*vē′yī*), an ancient city of Etruria and in early times the rival of Rome. Its very site is disputed, but it is now generally thought to be at Isola Farnese, about 12 miles from Rome. The struggle between the two cities is represented by Roman historians as commencing during the time of Romulus and continuing under all the other kings, except Numa, generally to the advantage of the Romans. At last the Romans determined to rid themselves of a rival by a siege, and persevered with great tenacity, although the city held out for ten years, and frequent attempts were made by neighboring states to relieve it It is said to have been finally taken by means of a mine which was directed into the citadel. The citizens were massacred or sold as slaves, and the land confiscated by the conquerors. The fall of Veii took place in 396 B. C., and after its fall it was gradually deserted. In later times a colony was planted there by Julius Cæsar and afterwards by Augustus, but it always remained an insignificant place.

Veins (in plants) are the extension of the vascular system into the leaves. See VENATION.

Velasquez (*vā-läs′kāth*), **Diégo Rodriguez de Silva,** one of the most famous of Spanish painters, was born at Seville in June, 1599. At an early age he was placed in the studio of Francisco Herrera el Viejo, and afterwards became the pupil of Francisco Pacheco, whose daughter Juana he married. In 1622 he visited Madrid, and while there painted so fine a picture of King Philip IV that he at once became famous and secured the royal favor and patronage, which continued to the end of his life. In 1629 permission was granted Velasquez to visit Italy, where he was received with the highest honor, Pope Urban VIII assigning him apartments in the Vatican. In the spring of 1631 he returned to Madrid, where he was cordially welcomed by his royal patron. He had a room assigned to him in the royal palace and the king would often visit him and watch him at his work. Additional honors were conferred upon him by the king from time to time until his death, which took place on Aug. 7, 1660, his wife, who was passionately attached to him, surviving his loss only about a fortnight. With the possible exception of Murillo, Velasquez takes the highest rank among Spanish painters.

Veloc'ity. See DYNAMICS.

Vel'vet, a fabric in which, besides the ordinary warp and weft, which are usually arranged as in twill-weaving, there is an additional weft, consisting of short pieces of silk, cotton or woolen thread doubled under the regular weft and brought to the surface in loops which are so close together as to conceal the regular web. The loops are afterwards cut evenly, and the ends thus made constitute a covering resembling a very short fur. In silk velvets the warp and pile threads are both of organzine silk, which is the strongest used in weaving.

Vena'tion, the arrangement of veins in leaves. The details of this arrangement are endless, but they may be reduced to two principal types. The two main types are known as closed and as open venation. In the former case, while the veins branch, they always run into one another, never having tree ends among the leaf-cells or in the leaf-margins. As a consequence, such leaves have even outlines, that is, they are not toothed or lobed. A very common form of the closed venation is that in which the main veins run parallel from base to apex, as in the grass-blade, and leaves of other monocotyledons. Such leaves are called parallel-veined. In other cases of closed venation, as in palms, bananas etc., the main veins are not parallel. The closed venation is characteristic of the monocotyledons. In open venation, characteristic of dicotyledons, the ultimate branches end freely, either among the leaf-cells or in the leaf-margins. Such leaves are said to be net-veined or reticulate, and they are much inclined to become toothed, lobed or compound. There are two forms of open venation: pinnate or feather-veined leaves, in which there is a main central vein or rib (midrib), from which the whole vein system arises; and palmate leaves, in which three or more main ribs rise together at the base of the leaf, and diverge upward. In the ferns the venation is open, but the veins fork repeatedly, such a venation being called dichotomous.

Veneer', a layer of wood cut very thin for the purpose of being glued to the surface of a more common kind. Only choice kinds of hard wood are sawed into veneers, and they are usually attached to pine or some other kind of soft wood, so as to give all the apperaance of being made solid. In this way the more costly kinds of furniture-woods are economically used by the cabinet-maker; for, with the improvements that have been made in the process of sawing, veneers as thin as paper can be produced.

Venezuela (*vĕn'ĕ-zwä'lȧ*), a republic of South America, lies between the Caribbean, the Atlantic, Guiana, Brazil and Colombia. Area 393,976 square miles, a third more than that of Texas, nearly two times that of France. Capital: Carácas (72,429). Population 2,713,703.

Surface and Drainage. Venezuela consists of mountainous lands in the north, 300,000 square miles of plains in the center and vast plateaus in the south. The most important ranges are the Merida, a continuation of the Colombian Andes, and two ridges paralleling the Caribbean and called the Maritime Andes. Between these lies a fertile valley, the densely peopled part of Venezuela. The low plains are grassy, pasturing large herds, the high plains timbered. The tableland along Brazil and Guiana breaks into numerous ridges and peaks, the Parima and Pacaraima ranges. The drainage is an oceanic system, the Orinoco and its tributaries emptying into the Atlantic, the northern streams into the Caribbean. Over 1,000 rivers exist, almost 500 in the Orinocan system. Seventy rivers are navigable for nearly 6,000 miles, and are open to large steamers the year round. The Orinoco belongs wholly to Venezuela. Rising almost in Brazil, circling 1,450 miles, it is navigable below and above its rapids, and, with navigable affluents, affords 4,300 miles of navigation. The Orinoco and Meta form the shortest route from Europe to the Andes. The Casiquiari and Négro, both navigable, link the Orinoco and Amazon. The coast, 1,584 miles long, provides 32 good harbors. The lakes, numbering 200, are of increasing importance to transportation.

Climate and Rainfall. The mountainous districts and lofty valleys have a temperate climate, the coast and Orinoco valley a tropical one. The wet season experiences heavy rains; the dry season is mild and vivifying. Precipitation occurs most heavily on the coasts, mountains and western plains. At Carácas the mean fall annually is 30 inches.

Resources. These include, as indigenous products, cacao, cinchona, copal, drugs, herbs, rubber and a substitute called balata, sarsaparilla and tonka. Native to Venezuela are 150 building and cabinet woods and over 20 dye and tan woods. Pearl, sponge and tortoise-shell fisheries have increasing value. Forty-seven minerals occur, comprising asphalt, coal, copper, granite, guano, iron, lead, marble, mercury, petroleum, platinum, precious stones and salt.

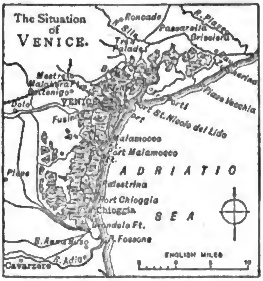
Agriculture. Coffee is the principal crop and the basis of Venezuela's wealth. Cacao and cocoanuts are largely grown. Cotton and sugar are grown, but not so extensively as formerly. Manioc and maize form the chief food-crops. The herds rival those of Argentina.

Commerce and Manufactures. Exports exceed $16,000,000, agricultural productions equaling 87% of the exports and coffee being nine tenths of the contribution by agriculture. Imports, about $9,000,000, include bagging, bags, cottons, flour, machinery, provisions, rice and woolens. Manufactures are limited mainly to cheap clothing, coarse cotton, farm-tools, organs, paper, pianos, spirits and sugar. The railways cover 540 miles, 382 being on the seaboard and connecting the larger cities with their ports.

Education. Legislative enactments (1870) provided well for primary instruction, which was made free and compulsory, but primary schools number only 1,330. Eleven national girls' colleges exist. There are professional and technical schools and two universities. Roman Catholicism is the religion of the people, but tolerance for other religions is professed.

History. Columbus discovered the Orinoco (1498), Ojeda the Maracaibo district (1499), naming it Venezuela or Little Venice from an Indian lake-village. Settlement occurred in 1520. Venezuela, through Bolivar, initiated Spanish America's revolt (1811), rising that year, uniting with New Granada and Quito (1819) as one republic, but in 1829 becoming a separate state. Comparative quiet obtained till 1846, but 50 revolutions have since occurred, ten succeeding. Emancipation (1854), encouragement of immigration, opening the Orinoco to navigation by all comers (1886), the influx of $50,000,000 of foreign capital and the settlement of the Guiana dispute with Britain by arbitration (1899) have been the significant events of the half century ending with 1911. General J. V. Gomez is the president now. His administration has been peaceful and prosperous, as compared with that of Cipriano Castro, his predecessor.

Venice (*vĕn'ĭs*) or **Venezia,** a city of northern Italy, is built upon a crowded cluster of islets in the lagoon of Venice, which is separated from a gulf of the Adriatic by a long and narrow sandbank, divided into a number of small islands by six narrow sea-passages. Inside of this sandbank and between it and the mainland, about four miles distant, is the lagoon, in some parts of which islets have formed, firm enough to be built upon and fertile enough to be cultivated. Here the city of Venice is built. As the islands in many places afford no suitable foundations for buildings, the city is largely built upon piles or stone. In the vicinity of Venice the ebbing tide lays bare a great plain of mud, laced by a network of narrow channels from which the sea never retires, while at high water the whole surface is covered by the sea to the depth of one or two feet. The city of marble palaces seems to rise like a vision out of the sea. This alone suffices to make it at all times an object of fascination, but in summer and autumn, the season of the highest tides, when the grand place of St. Mark's is partially flooded, the city is marvelously beautiful, and must continue to be a place of interest so long as it stands. The present population is 160,000. Although the many marshy islands extending along the northwestern shores of the Adriatic are known to have been used by the inhabitants of Venetia, one of the provinces into which Italy was divided by Constantine, as places of retreat from barbarian invasions as early as the 5th century, the first permanent settlement on the site of the present city cannot be traced farther back than the beginning of the 9th century. The physical conditions with which the early inhabitants had to contend could hardly have been more unfavorable to the development of a great and prosperous city. The soil possessed no kind of mineral wealth, the thickets which diversified the surface of the barren marshes produced no valuable timber, good drinking-water was hardly to be obtained; yet it was here that the Venetians by their energy, their industry and their genius for commerce succeeded in establishing and maintaining their independence, in making other nations their tributaries, in sending their fleets to distant shores, in controlling the destiny of empires and in building up a naval power



unique in history. Venice may be said to have risen out of the ruins of the Roman empire and to have maintained its separate nationality through the middle ages and down to 1797, when Napoleon Bonaparte entered the city, proclaimed the republic at an end and transferred her territory to Austria. In 1806 the city with the territory of Venetia was annexed to Italy by the treaty of Pressburg, but it was again transferred to Austria in 1814, under whose dominion it remained until 1866, when it was once more incorporated in the kingdom of Italy. Consult Brown's *Venice*, McClellan's *Venice* and Oliphant's *Makers of Venice*.

Venice, Gulf of, that portion of the Adriatic Sea which indents the Italian province of Venetia to the extent of 50 or 60 miles.

Ve'nus, the Roman goddess of love, subsequently identified with the Greek Aphrodite. Originally, Venus does not seem to have occupied a conspicuous place in the religion of the Romans, and she scarcely figures in the history of Rome under the kings; but gradually, as the myth of the Trojan origin of Rome gained ground, the worship of Venus emerged into importance. Aphrodite was the mother of Æneas, and Aphrodite became Venus. Ares was Mars, and Mars was the national god of the Roman people; then, as in Greek mythology Aphrodite was beloved of Ares, so Venus was represented as the paramour of Mars, and thus was advanced by the poets to the dignity of the divine mother of the Roman people. Several temples were erected to her in Rome at different times and under different names, and rites were celebrated in her honor during the month of April — the springtime of the year being thought favorable to the growth of the tender emotions.

Venus. See PLANETS.

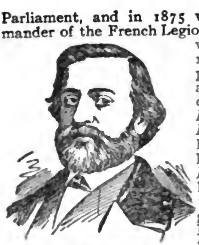
Vera Cruz (*vā'rȧ krōōs*), an important city on the eastern coast of Mexico, about 200 miles east of the City of Mexico, with which it has communication by railway. It is built in a semicircle facing the sea, the streets, which are wider than is usual in tropical countries, running east and west from the harbor, with others crossing them at right angles. The town is defended by a wall six feet in height and other substantial works, and also by the castle of St. Juan de Ulloa, which stands upon an island of the same name, about half a mile from the shore. Vera Cruz has been greatly improved in recent years. The main streets have been asphalted and otherwise improved and beautified. Complete new sewers and drainage works have been constructed. It has now an excellent harbor with up-to-date appointments, port works, custom houses, etc. The chief exports are precious metals, cochineal, sugar, flour, indigo, leather, vanilla, etc.; and the chief imports cotton, woolen, silk and linen goods, brandy, iron, hardware and earthenware. Vera Cruz was bombarded and taken by General Scott during the Mexican War and by the allied British, Spanish and French squadrons in 1861, when they sought to set Archduke Maximilian of Austria upon the throne of Mexico (*q. v.*). Population 29,164.

Verrazano (*vĕr'rät-sä'nō*), **Giovanni da** (1480–1527), Florentine navigator, on much of whose exploratory work in the New World doubt has been cast. Moreover, little is authentically known as to his early career, some authorities relating that even the name he passed under was not his own; while, so far from serving his country, it is stated that he was a corsair in the service of France and, as such, preyed upon Spanish and Italian commerce. His first voyage of discovery, it is believed, was undertaken in the service of Francis I of France. Under a commission from the monarch he commanded an expedition in 1524 to the New World, which explored its coasts from Cape Fear southward and then northward to Newfoundland, touching at ports on the coast of Nova Scotia and Cape Breton and entering also, it is understood, New York and Narragansett Harbors. Verrazano's expedition northward, we know, gave a claim, though possibly a shadowy one, of first discovery of a vast region to France, under whose authority he sailed and that ten years before the voyage to the Gulf of St. Lawrence of Jacques Cartier of St. Malo. Of Verrazano's later career, on his return to France, little also is definitely known. Some biographers assert that in 1525 he took part in the battle of Pavia, and for a time was a prisoner of the Spaniards. For critical discussion of authorities consult Winsor's *Narrative and Critical History of America.*

Verbe'na, a numerous species of annual herbs or shrubs, common in the gardens of the United States, though native to tropical or semitropical America. The cultivated varieties usually are propagated from seeds, though they are also found growing as weeds in waste ground. They grow best on a high, garden soil, when well-fertilized. The verbena flowers showily and in varied colors (chiefly lilac, purple and white pink) on slender spikes, some varieties having a sweet scent, especially those native to Brazil. The plant is frequently used in medicine as a cooling remedy.

Verdi (*vĕr'dē*), **Giuseppe,** Italian operatic composer, was born at Rancole in the duchy of Parma in 1814 and received his musical education at Milan. His first work was a musical drama, which appeared in 1839, and he produced a number of operas, which, while they abound in melody and striking dramatic effects, are characterized by noisy orchestration. In 1861 he was elected to

Parliament, and in 1875 was made commander of the French Legion of Honor. He was also decorated by the emperor of Russia and by the khedive of Egypt. *Il Trovatore* and *La Traviata* perhaps are his best-known operas. *Falstaff*, his latest production, was first given at Milan, Feb. 9, 1893, attracting visitors from all over Europe, the seats being sold at $50 each. Verdi died at Milan, Jan. 27, 1901.



GIUSEPPE VERDI

Verestchagin (*vyĕ′rĕ shchä′gĭn*), **Vasili,** a Russian battle-painter, was born at Novgorod, Oct. 26, 1842. In 1867 he was a soldier in Turkestan, and in 1877-8 in the Russo-Turkish war, in which he was wounded. He produced numerous paintings, many of them scenes in East India, while others are war-sketches. A collection of his pictures has been exhibited in New York, Chicago and other American cities. He died on April 13, 1904.

Ver′gil, Publius Vergilius Maro, a Roman poet, was born on Oct. 19 of 70 B. C. at Andes, near Mantua, Italy. He studied at Cremona, Milan (then Mediolanum) and Naples, his father, a small landed proprietor, evidently appreciating his son's genius and having him carefully educated. He was not a Roman citizen by birth and does not seem to have aspired either to military or to political distinction. When the lands of the country were seized for the benefit of the army, his father lost his small farm, but it was restored by Vergil's influence with Pollio and the young Octavianus (Augustus). He had, however, to escape by swimming across the river from the violence of the soldier who held possession of it. He lived in Rome for a time, where for friends he had Mæcenas, Varius and Horace and afterward at Naples and Sicily, and went with Horace on his famous journey to Brundusium. In 19 B. C. he went to Athens, intending to spend three years in Greece and Asia in perfecting his *Æneid*, which was finished, but met Augustus at Athens and was persuaded by him to return to Italy. He died on the journey, Sept. 21, 19 B. C. at Brundusium. His tomb at Naples was long held sacred and visited as a temple.

His fame rests on three works: the pastoral poems or *Bucolics*, *The Georgics* and *The Æneid*, though a few other poems are thought to have been written by him. *The Eclogues* or *Bucolics* were published in Rome in 37 B. C., and are poems treating of matters of current interest, connecting with them the love of home and of nature. *The Georgics* are said to have been written at the suggestion of Mæcenas, and treat of the life and work of an Italian farmer. The cultivation of the fields, the constellations which serve for a calendar, the signs of the weather. the culture of the olive and the vine, the rearing of herds and cattle and the care of bees are the subjects of the four books. His great work, *The Æneid*, is in 12 books, and gives the history of the wanderings of Æneas and his final settlement in Latium. He had not finished the poem to his satisfaction, and in his last illness is said to have called for the cases that held the manuscript, intending to have it burnt. He also left directions in his will that none of his unpublished writings be given to the world, but the commands of Augustus prevented the loss of this great poem. The Romans were very proud of Vergil and his work; his writings were used as text-books and copied by later poets; while various traditions made him looked upon as almost a magician. Dryden's and William Morris' translations of the *Æneid* are among the best English translations. Consult Sellar's *Roman Poets of the Augustan Age*. See ÆNEAS, HOMER, ILIAD, ODYSSEY and TROY.

Ver′mes or **Worms,** the subkingdom made up of worm-like animals. Under this heading are included an immense number of animals that are so diverse in structure that the very general title of worm is justifiable only as applying to their form or shape. It embraces about a dozen classes whose relationships are imperfectly known. The interest in the group is considerable, because the worms show affinities with the higher animals, including even the vertebrates. All are animals with three cell-layers, a body-cavity and a nervous system consisting of a brain mass, on the dorsal surface, and a ventral nerve-cord divided into joints. The upper and lower parts of the nervous system are connected by a ring of nervous substance that surrounds the throat. From the central nerve-cord are given off nerve-trunks which branch profusely and terminate in minute twigs within the tissues. The digestive system is diverse, the circulatory system is imperfect, and there usually is a set of tubes or *nephridia* connected with excretion. The worms live in the sea and fresh water, in the earth and upon it and as parasites within the interior of the tissues of various animals. They are divided into the jointed or *segmented* worms and the *unsegmented* worms. The former are more generally known and are mostly included under one class, called *annelida*. This class embraces the earthworms, the leeches and a few forms living in the sea. The earthworm series have hair-like bristles (*setæ*) on each joint, which aid in locomotion. The leeches are not provided with bristles, but have two round suckers, one at either end of the body. Some of the leeches live on fishes, feeding on the mucus which comes from the bodies of those animals; others are bloodsuckers. The latter are provided with sharp jaws, located within the forward sucking-disc, with which they cut the skin of the animals upon which they fasten. The unsegmented worms embrace the flat worms (*plathelminthes*) and the roundworms (*nemathelminthes*). Some of the former class live in the water and moist earth, and others of the same class are internal parasites, like tapeworms. The class of roundworms likewise includes forms living freely in the water and other substances, as horsehair worms and vinegar and paste eels. Examples of parasitic roundworms are the stomach-worms and pinworms of children and the trichina. The latter is the most dangerous of the parasitic worms, getting into the system by eating raw or partly cooked pork. Besides the *annelids*, flatworms and roundworms, there is a fourth class called *molluscoidea*. Under this heading are grouped a few forms that have given naturalists no little trouble to classify. One division of them contains moss-animals (*polyzoa*), both of salt and fresh water. They occur in branching colonies which resemble low plants in general form. The other division includes shelled-worms, called brachiopods, which were formerly included among the mollusks near the clams. See ROTIFER, TRICHINA and VERTEBRATES.

Vermil'ion, a bright scarlet color which is obtained from a native ore called cinnabar, or is made artificially from mercury and sulphur. This compound, sulphide of mercury, is thrown into tall, earthen pots, and the lower parts kept red-hot. The substance volatilizes and coats the pots with cinnabar. The pots are broken and the cinnabar scraped off, ground and dried, when it is ready for use as vermilion. Cinnabar, the ore from which vermilion is obtained, is a compound of sulphur and mercury, of a blood-red color. It is simply ground fine, and then known as vermilion. The most important mines are those of Almaden in Spain, which have been worked for 3,000 years, and of New Almaden in California. There are mines in Brazil, Peru, Austria, Hungary, China and Japan.

Vermont' (from the French *vert mont* — green mountain), a North-Atlantic state of the Union, popularly known as the Green Mountain State, has an area of 9,565 square miles. Its length is 155 and its extreme breadth 90 miles; its northern boundary being the Canadian province of Quebec, its eastern one New Hampshire, its southern one Massachusetts and its western one New York. The Connecticut River separates it from New Hampshire, while its northwestern boundary is chiefly formed by Lake Champlain, which separates it from New York. Its capital is Montpelier. The total population of the state is 364,322, and the chief towns, in addition to the capital are Burlington, Rutland, Barre, Brattleboro and St. Albans. Among the foreign born citizens, French and English Canadians predominate. In the native population are many former residents of neighboring states.

Surface and Climate. The main feature of the surface is the Green Mountain range, which traverses it northeast and southwest, and forms the watershed. The range has a number of considerably elevated peaks, at a height varying from 4,001 to 4,364 feet, the latter representing the altitude of Mt. Mansfield. The state's general elevation is between 600 and 1,000 feet, though there are low sections in the valleys, about the lakes and along the rivers. It has a long and generally severe winter, with frequent heavy snowfalls, but the winter is bracing, while the summer usually is bright and pleasant.

Resources and Industries. Forests, chiefly of spruce and hemlock cover the state, but in parts there is considerable agricultural land, though the farms are small, as a rule, and generally devoted to dairy interests and the cultivation of hay, oats, barley and corn. The apple is largely cultivated, and the state extensively produces maple-sugar and maple-syrup. The soil for the most part is poor and stony, though on the hill-slopes there is good herbage for the grazing of cattle, sheep and other animals of the farm.

The production of lumber in Vermont, as in other parts of the country, has declined in recent years, but there has been a large development in mining the state's rich resources of building and monumental stone—particularly marble and granite. A small amount of limestone is also mined.

Vermont is not only the chief source of marble in the United States (about two-thirds entire output) but the stone is of the best quality produced in this country. The deposits are found in the western part of the state; principally around West Rutland, Pittsford and Proctor. It is the Rutland marble that is used for monuments and statuary. It is less lustrous than the famous Carrara marble, but is more durable. There are other quarries in Dorset and East Dorset. The finest marbles in this region are distinguished by the light pencilings of pale brown and greenish lines. They are used for building purposes. The Harvard Medical School is built of this marble. The marbles of Rutland, Proctor and Dorset include those of darker shade—olive and other shades of green, yellow and pink, and what is known as "moss vein." This marble is largely used for monumental purposes. At Swanton, pink and red marbles are found, and at Roxbury a fine, serpentine marble, called "green marble" or "verde antique." Barre owes its importance to its location near the largest granite quarries in the state. There are other important quarries near Williamstown, Berlin, Woodbury and Dummerston.

The slate quarries are in the southwestern part of the state. Of this there are two varieties, "sea green," "unfading green," and a slate of a purplish hue. Vermont furnishes over one-sixth of the slate output of the United States.

Other important industries of the state include lumbering, the manufacture of paper and wood pulp, foundry and machine shop products, grist and flour mills, dairying, including the manufacture of cheese and condensed milk, hosiery, woolen and knit goods, scales, balances and patent medicines (See INDEX for articles on most important products and industries mentioned in this article).

The mountain streams of Vermont are an important source of power for numerous saw mills. The great scale works of St. Johnsbury and Rutland ship scales to all parts of the world.

The first industry of the State to attain considerable proportions was the rafting of lumber to Quebec by way of Lake Champlain and the Richelieu and St. Lawrence Rivers. The traffic in lumber moving in the direction of Boston made Burlington, when railroads began to be operated, a great lumber market. (See United States map, page 1972.)

Vermont's forests are the basis of the paper and wood pulp industries, and this fact, and the Connecticut River, determined the location of Bellows Falls. Why? (Water power and raw material.)

Education. A superintendent of education has charge of the public-school system, which annually costs over $1,550,000, about three fourths of which are paid for teachers' salaries. The state school-population is over 74,700, the enrollment being in excess of 68,000, while the average daily attendance is close upon 52,100. The state has a permanent school-fund, and employs about 3,300 teachers, chiefly women. For the training of teachers, beyond the attention given them in the advanced classes of the high schools and academies, there are summer-schools and three state normal schools at Randolph, Castleton and Johnson. At Burlington is the university (founded in 1791) of the state, with an agricultural college attached, which receives state aid. Higher education is also represented by Middlebury College, with 23 instructors and 364 students. The latter is nonsectarian, as is also Norwich University at Northfield, which has 15 instructors and 182 students. Moreover, there are an industrial school for children of both sexes at Vergennes and a soldier's Home at Bennington, the latter receiving federal aid. Vermont also has the usual charitable and penal institutions, besides the hospitals, orphanages and similar institutions maintained by private beneficence.

History and Government. From Vermont's proximity to the French province of Quebec, the region was in early days explored by the French. Lakes Champlain and George are known to have been visited by Samuel de Champlain in 1609, while on an expedition with a band of Hurons, Montagnais and Algonquins against the Iroquois of the region. At first only trading-posts were established in northern Vermont, including stockades, at what now are Crown Point, Ticonderoga and Colchester, at and about which settlements grew in time, though harrassed by the Indians both local and from Canada. Raids from the latter quarter, however, came to an end after the expedition from Crown Point in 1759, led by Major Robert Rogers, against the Saint Francis Indians, who had long been the scourge of the New England frontier. For many years settlement was at a disadvantage owing to the uncertainty of ownership over the region, it being claimed alike by New Hampshire and by New York a condition of things adverse to the settlers' interests, which forced them to remain aloof from both and even to resist by force the writs and other law-processes especially of the New York courts. During the period of the Revolution hostility to New York brought the organization of the Green Mountain Boys into existence, under Ethan Allen, to defend their own rights as well as to take part against the British in the war in the Canadian avenues of approach into Vermont. It was at Bennington that Stark (*q. v.*) of Vermont, assisted by troops from Massachusetts and New Hampshire won the battle on Aug. 16, 1777, that turned the tide against Burgoyne and made possible the great American victory at Saratoga, N. Y. The interstate disturbances and disaffections were finally removed, when New York in 1790 received $30,000 from Vermont in adjustment of the disputed land-claims, and waived its objection to the admission of the region as a state. In the following year Vermont formally entered the Union, the first state to be admitted under the constitution, having had no previous existence as a territory. During the Civil War the state patriotically did its duty in the extent of the local forces it put in the field. At their disbandment Canada for a time became the object of lawless raids by Fenians across the border from St. Albans. The present constitution dates from 1793, with repeated, subsequent amendments. The local legislature consists of 30 senators and of 246 representatives, the chief executive, besides the governor and the lieutenant-governor, consisting of a secretary of state, a treasurer and a superintendent of education. The judicial authority consists of a superior court, of seven justices, who are appointed biennially. Vermont sends two members to the Federal House of Representatives. Consult Robinson's *Vermont* in the American Commonwealth Series and Gilman's *Bibliography of Vermont*.

Verna'tion, the arrangement of leaves in the bud, sometimes called *præfoliation*. Numerous names have been applied to various forms of vernation. Among the principal ones are imbricate, in which the edge of a leaf overlaps its neighbor; valvate, in which neighboring edges touch, but there is no overlapping; conduplicate, in which the leaves are folded lengthwise; convolute, in which the leaf is rolled from one margin; circinate (characteristic of ferns), in which the leaf is rolled from the apex downward.

Verne (*vârn*), **Jules,** a French writer, was born at Nantes, Feb. 8, 1814. He first wrote plays and opera pieces, and for some time was connected with a theater. His wild and improbable stories have most of them been translated into English. The first one to make him known, published in 1863, was *Five Weeks in a Balloon*. It was based on modern science and had an air of reality. His other writings, except an illustrated geography of France, are of the same character. His works include *A Journey to the Center of the Earth*, *Twenty Thousand Leagues under the Sea*, *From the Earth to the Moon* and *Around the World in Eighty Days*. He died at Amiens on March 24,1905.

Vernet (*vâr'nā'*), **Claude 'Joseph,** an eminent French painter, was born at Avignon, Aug. 17, 1714. When on a voyage to Rome, in a terrible storm he was fastened to the mast, and the scene so impressed him that he became a painter of sea-views, being considered the first marine painter in Europe. His best-known work is a series of the seaports of France, executed by royal order. His works have been extensively engraved. He died in Paris, Dec. 3, 1789.

Vernet, Emile J. Horace, a French military painter, was born at Paris, June 30, 1789. His first military painting was the *Capture of a Redoubt*. His pictures of the life of Napoleon and the army, as *The Dog of the Regiment*, *Soldier of Waterloo*, *Barrier of Clichy*, were very popular, and engravings of them could be found in nearly every cottage in France. Louis Philippe sent him to represent the French government at Rome. He traveled extensively, wrote several works on art, and made hundreds of designs for illustrated books. His fame rests on his military pictures, as the battle-pictures of Jena, Wagram and Fontenoy and the *Capture of the Imala*. He died at Paris, Jan. 17, 1863.

Ver'non, Edward, an English admiral, was born at London, Nov. 12, 1684. He was at the taking of Gibraltar in 1704, and was made a rear-admiral when only 24. While a member of Parliament, he declared that Porto Bello could be taken with only six ships of war, and when put in command of six vessels and sent to the West Indies, he took the city in one day, with the loss of only seven men. The English people were wild over the victory; Vernon's birthday was celebrated in London with public illuminations; and 130 medals were struck in his honor. With a larger fleet he attacked Cartagena, but failed to take it. In the invasion of the Pretender, Vernon's fleet had command of the coasts of Kent and Sussex. On account of a quarrel with the officers of the admiralty, his name was struck from the list of English admirals. George Washington's older brother, Lawrence, was with Vernon on his expedition against Cartagena, and afterwards in his honor named the Washington home on the Potomac Mt. Vernon. Admiral Vernon died in Suffolk, Oct. 29, 1757.

Vero'na, a city of northern Italy, is situated at the foot of the Tyrolese Alps, on Adige River, 62 miles west of Venice. The fortifications, begun by the Romans and carried on by Charlemagne, were almost destroyed in 1801, but were rebuilt by the Austrians. The present fortifications are a circle of forts far outside the old city-walls. It is a city of palaces; the Scaligeri palace, built in 1370, and those of the Canossa and Pompeii families in the 16th century are among the finest. Among the many churches are the cathedral, consecrated by Urban I in 1187 and having Titian's *Assumption* on its walls; St. Anastasia, one of the finest Gothic churches in Italy; St. Zeno, rebuilt in the 12th century; and that of San Giorgio, with paintings by Paul Veronese. Among Roman antiquities is a ruined amphitheater, built of marble and seating 22,000 people, much like the Colosseum at Rome. There are some fine streets and squares, many art-collections, an academy of painting and sculpture, a theological seminary, a city library and beautiful bridges across the Adige. Its manufactures are of silk, linen and woolen goods, and it has a trade in sumac, grain and oil. The tomb of *Romeo and Juliet* has been destroyed, but another has been found to satisfy the curiosity of tourists. Verona was a Roman colony, its walls and gates having inscriptions dating from the 3d century. The ancient moat still remains as a canal around the old part of the city. It was taken by Constantine (312), Theodoric (489) and Charlemagne (774), and afterwards became a free city. For 100 years it was ruled by the Scala family. In the 15th century it was conquered by Venice. The French took the city in 1796, and ceded it to Austria in 1797. Since 1866 it has been a part of the kingdom of Italy. Population 74,271.

Veronese (*vā'rō-nā'zā*), **Paolo,** the name given to Paolo Cagliari, one of the great Italian painters, who was born at Verona in 1528 or 1532. His father was a sculptor and wanted to train the boy for the same profession, but his taste for painting was so decided that he was put under the teaching of an uncle, who was a painter. His first pictures were executed in the Church of St. Sebastian at Venice, and were scenes from the history of Esther, *Baptism of Christ*, *Martyrdom of St. Sebastian* and others. He was only 28 at the time, but this work placed him at once in the same rank as Tintoretto, then 45, and Titian, then in his 80th year. He obtained the commission for painting the ceiling of the library of St. Mark, and the work was so fine that even his rivals joined in voting him a golden chain as an honor. At Verona, his native city, he painted the *Banquet in the House of Simon the Pharisee*. His best-known work is the *Marriage at Cana*, now in the Louvre. It has about 120 figures or heads, many of them portraits, as Queen Eleanor of France, Francis I, Queen Mary of England, Tintoretto, Titian and Veronese himself. Other pictures are *Susanna and the Elders;* the *Supper at Emmaus; St. Helena's Vision of the Cross;* the *Annunciation; Esther Presenting Herself to Ahasuerus;* and *Venice, Queen of the Sea*. He died at Venice, April 19, 1588.

Veron'ica, St. or **Bereni'ce,** according to tradition, a woman of Jerusalem who, moved with pity at the sight of Jesus bending beneath the burden of His cross on His way to Golgotha, gave Him her kerchief that He might wipe the drops of agony from His brow. Jesus after using it handed it back to her, with the image of His face marked upon it. With this napkin, Veronica is said to have cured Tiberius, the Roman emperor, when very sick, and so convinced him of the divinity of Christ that he sent Pilate into exile. The napkin, it is claimed, is now at St. Peter's at Rome.

Versailles (*vĕr-sālz'*), a city in France, 11 miles southwest of Paris, where Louis XIII had a country villa and Louis XIV built the finest palace in France, costing so enormous a sum that he destroyed the accounts. The marble court, the chapel, the halls and galleries filled with historical pictures (the collection made by Louis Philippe having 5,000 works of art and costing $5,000,000), the battle-gallery hung with pictures of French victories, the Hall of Mercury, Hall of Apollo and galleries of war and peace are among the many departments of this grand palace. The gardens surrounding it with their beautiful fountains and statuary attract crowds of visitors from Paris. The orangery has 1,200 orange-trees, one said to be 465 years old. The grand canal, 200 feet wide and a mile long, in the time of Louis XIV was covered with gondolas and lighted up with fireworks. The park connects with the two palaces, the Grand Trianon, a one-storied building with wings, and the Little Trianon, a pavilion with an English garden around it, the favorite residence of Marie Antoinette. There are churches, a museum, a military hospital and military school in Versailles, but no buildings of interest except the palaces. The treaty of peace, by which England recognized the independence of the United States, was signed at Versailles in 1783. The states-general of France met here in 1789 and bound themselves never to separate until they had given France a constitution. Louis XVI was driven from Versailles to Paris and to Prison. Louis Philippe restored the palaces at a cost of $5,000,000. During the Franco-German War it was the headquarters of the German army, and King William I was proclaimed emperor of Germany there in 1871. It was the seat of government while the Commune held Paris, and the French Parliament met there until 1871. Population 54,982.

Ver'tebrates, the highest subkingdom of animals. The difference between the back-boned animals and the lower animals without backbones was recognized by Aristotle more than 2,000 years ago. It was not until 1797, however, that Lamarck founded the group of *vertebrata*, and defined it with distinctness. For a long time the line separating the vertebrates and the invertebrates was supposed to be a very sharp one. But a more thorough study of animal structure showed that the vertebrates have many affinities with the invertebrates, and doubtless were derived from them. When the group was first founded, the distinguishing mark of vertebrated animals was supposed to be the possession of a backbone composed of bony vertebræ. But this idea has become so much modified that it is no longer used in defining the group. Kowalevsky, a Russian naturalist, showed in 1866 that the tunicates develop in the same manner as the lowest vertebrates and, in their youth, closely approach the frog tadpole. This led to expanding the vertebrate group so as to include the tunicates, which were previously classed with the worms. Some other forms were later included for similar reasons. There are a number of forms, like the hagfish and lamprey, that have no bony spinal column, but nevertheless are true vertebrates. Therefore, the question arises: What are the marks of vertebrates, that distinguish them from all other animals and at the same time are possessed by all members of the group? There are three universally recognized features besides some others of smaller importance. The distinguishing features are (1) the possession of a nerve-cord located on the dorsal surface, that of invertebrates being on the ventral side of the body; (2) a gristly rod or notochord, that runs lengthwise through the body just below the nerve cord. This notochord is the scaffolding about which the bodies of the vertebræ are formed when they are present and (3) the possession of gill-clefts. These structures are openings through the neck into the pharynx, and are present in fishes throughout life. They appear without exception in the embryonic stages of all higher animals as hereditary survivals, but soon become closed, and disappear before the period of birth. See Development of Animal Life.

It is not possible to trace with certainty the path along which the vertebrated animals have been developed, but all possess some affinities (like jointed bodies and segmented kidneys) with the jointed worms, and the theory is widely accepted that vertebrates had remote ancestors that were very like the jointed worms. This is called the annelid theory, and was founded in 1875, chiefly by Dohrn and Semper. It is to be remembered, however, that there are other rival theories, and no one claims that any living animals represent the ancestors of vertebraes. These ancestors, whatever they were, have been long extinct.

The vertibrae subkingdom is divided into five classes: fishes, amphibia, reptiles, birds and mammals, all of which are further subdivided into orders, families and smaller groups. The principal facts of importance in reference to the different classes will be found by consulting those topics. See Tunicates.

Vespa'sian, Titus Flavius Vespasianus, a Roman emperor, the tenth of the 12 Cæsars, was born in the Sabine country in 9 A. D. He held several Roman offices, as that of military tribune in Thrace, quæstor in Crete, ædile and prætor. At the head of a legion in Britain he conquered the Isle of Wight in 43. He was governor of Africa, the accounts of his reign there disagreeing; but whether a good or bad ruler, he was pelted with turnips by a mob. He was sent in 67 to war in Judaea, and conquered almost the whole country except Jerusalem, in two years. The civil war between Otho and Vitellius gave him the opportunity to profit by his popularity, and he was proclaimed emperor at Alexandria in 69. The army of the east stood by him and, entering Italy, defeated and put to death Vitellius, sacked Cremona and took Rome after a terrible fight, in which the capitol was burned. Vespasian entered Rome in 70, where he restored the capitol, rebuilt the city, reorganized the army and by his own example shamed the luxury and extravagance of the period. The Jewish war, under the lead of his son Titus (*q. v.*), ended with the capture of Jerusalem, and the temple of Janus was closed, Rome enjoying peace for the nine years of Vespasian's reign. A new forum, the public baths, the temple of peace and the Colosseum were begun in Rome in the reign of Vespasian. He favored men-of-letters, Quintilian among others, to whom he gave a pension of $4,000 a year. He died on June 24 of 79. Consult Merivale's *History of the Romans under the Empire.* See Jews.

Vespucci (*vĕs-pōōt'chē*), **Amerigo,** an Italian navigator, was born at Florence, Italy, March 9, 1451. He began life as a clerk in the commercial house of the Medici, and in their employ was sent to Spain, where, at Seville, he entered the service of a Florentine merchant who had fitted out the second expedition of Columbus, in 1493. Vespucci finished a contract his master had with the king of Spain to fit out 12 vessels for him. Vespucci, according to his own story, sailed first, perhaps as an astronomer, with an expedition from Cadiz on May 10, 1497. After touching at the Canary Islands they reached "a coast which we thought might be that of a continent"—probably, from the description, Campeche Bay—and then sailed as far north as Cape Hatteras, returning to Spain in 1498. In a second voyage, in 1499, he reached the coast of Brazil, sailing north to the mouth of the Amazon and to Santo Domingo; and he made another expedition to Brazil, going as far as Georgia; and in 1503 he made his fourth voyage. Vespucci wrote a journal after his fourth voyage, but nothing of it remains except allusions to it. He also wrote several letters to a school-fellow in Florence, of one of which a Latin translation was printed in 1507. His claim that he reached the American continent in 1497, 18 days before the Cabots, has been disputed, and the general opinion is that he did not make that voyage, but there is no evidence that he had any thought of taking the honor of the discovery of the New World from Columbus. The name America was first applied to the New World by a geographer of Freiburg, named Waldseemüller, who, referring to Vespucci's letter says: "Now that a fourth part (of the world) has been found by Amerigo Vespucci, I do not see why we should be prevented from calling it Amerigo or America." Vespucci died at Seville, Feb. 22, 1512. Consult *Life and Voyages of Americus Vespucius* by Lester and *Narrative and Critical History of America* by Winsor.

Vest, George Graham, United States senator from Missouri, was born at Frankfort, Ky., Dec. 6, 1830, and graduated at Centre College, Kentucky, and at the law department of Transylvania University at Lexington, Ky. In 1853 he removed to Missouri, where he practiced law, and became a member of the legislature. During the Civil War secessionist leanings induced him to become a member of the Confederate Congress and later of the Confederate senate.

In 1897 he was elected Democratic member for Missouri in the United States senate, where he was prominent in many important debates. He was re-elected and served on committees on finance, commerce and the transportation of meat products. He died on Aug. 9, 1904.

Ves'ta, in Roman mythology, was the goddess of fire and the domestic hearth. The guardianship of the sacred fire in her temples was given to priestesses, called *Vestal Virgins*, at first four, but afterwards six. They were from six to ten years old when chosen, and spent 30 years in the service, the first ten in learning their duties; the second ten in acting as priestesses and guarding the sacred fire which must not be allowed to go out; and the last ten in teaching the new priestesses. If a vestal virgin violated her vow, she was stoned to death or buried alive. They lived in great splendor at the public expense, had the best seats in the theaters, and rode in state, preceded by a lictor. In Greece the priestesses of Vesta or Hestia were widows. On the first day of March, the Latin New Year's Day, the sacred fire of Vesta was renewed. The *Vestalia*, the chief festival in honor of Vesta, were celebrated on June 9, after which the temple was closed for five days for cleansing. In private houses the feast was kept by eating fish, bread and herbs before the hearth and the images of the *penates* or household gods. The worship of Vesta died out in the 4th century, after Christianity became the Roman religion.

Vesu'vius, Mt., the most celebrated volcano in the world, is on the Bay of Naples in Italy. It is about 4,000 feet high, and has two distinct peaks, called Somma and Vesuvius, though it had but one in ancient times. It is about 30 miles around the base of the mountain, and the ascent on the west side for three miles is a gradual slope to the cone, which rises nearly 2,000 feet higher. The top of the cone is cut off or truncated, and is 2,000 feet across, and the crater is 500 feet deep. About 40 kinds of minerals are found around the cone in the ancient lavas. Two electric railways carry visitors within a short distance of the mouth of the crater, and an observatory has been built about half way up the volcano, to study the eruptions and watch for indications of an approaching earthquake. The region around Vesuvius has been densely populated for more than 20 centuries, in spite of its numerous eruptions. The great eruption of Aug. 24 in A. D. 79, which destroyed Herculaneum and Pompeii, is the first one of importance. It was not lava but showers of ashes, condensed into mud by the rain produced by the steam of the volcano, that seems to have overwhelmed the cities below it. In an eruption in 472 the ashes were carried to Constantinople, and in 1066 the lava flowed to the sea. The next great eruption was in 1631, when 18,000 lives were lost. A stream of lava 1,204 feet wide and 15 feet high destroyed the town of Torre del Greco in 1794. The eruptions increased in frequency in the last century, and the volcano is never entirely quiet. Consult *Volcanoes* by Scrope and *The Geology of Monte Somma and Vesuvius* by Johnstone-Levis. See HERCULANEUM, PLINY and POMPEII.

Ve'to, a word introduced from the Latin, meaning I forbid. It is used to indicate the power possessed by the people or their rulers to object to an act of the legislature and in some degree to prevent its being carried out. The Roman tribunes had the power of stopping the decrees of the senate by using the word *interdico* (I interdict); and so it is customary to say that the use of the veto began with them. In Poland it was settled by law in 1652 that in the imperial diet any deputy could hinder the passage of a measure by saying *Nie dozwalam* (I do not allow). In the national assembly of France, at the revolution, the king had a conditional veto, but Napoleon restored an absolute veto to the ruling power. The sovereign of England has the power to veto a bill of Parliament, but the right has not been used since 1707. The veto in the United States is the power of the president to refuse his signature to a bill passed by both houses of Congress; but Congress can pass a bill over the president's veto by a majority vote of two thirds in each house. President Jackson's veto of the bill to recharter the Bank of the United States is one of the earliest instances of the use of this power by the president. See CONGRESS, PRESIDENT and UNITED STATES.

Vevey', a town of Switzerland, ten miles southeast of Lausanne, on Lake Geneva. Its situation on the lake with a range of mountains opposite, and the fine scenery near it make it very attractive to tourists. It is built in a triangle, with a fine market-place and two or three churches. Population 11,916.

Vi'a-Ma'la, a gorge in the canton of Grisons, in Switzerland, 1,600 feet deep, through which rushes the Hither Rhine, looking like a thread. It is about two miles long, and the great walls of rocks are so hard that apparently they have not been changed by the effects of the weather since they were thrust apart, and they are so near together in some places that a trunk of a tree or a stone may be wedged in between them. It was once considered inaccessible and called the Lost Gulf, but a road has been built by blasting from 400 to 600 feet above the river, crossing from side to side by bridges, and protected by overhanging rocks or a wooden roof from falling trees and stones.

Vibur'num, a class of shrubs and small trees belonging to the honeysuckle family. Of the nearly 80 species about a dozen are found in the United States, growing in woods or hedges. The hobble bush, whose straggling branches catch the traveler's foot, is found in the northern states; the sheepberry or sweet virburnum, having clusters of fragrant flowers in May or June and a blue-black, eatable fruit, and growing sometimes from 20 to 30 feet high; the arrowwood, with sharp teeth on its large-veined leaves; and the maple-leaved virburnum, easily mistaken for a small maple tree and called dockmackie in some parts of the country, are the most common varieties. The lamestinus, a native of southern Europe, with evergreen leaves and white flowers, belongs to the viburnums and is a favorite house-plant.

Vi'car of Wakefield, The, an idylic novel written by Oliver Goldsmith (1766). Goethe called it one of the best novels ever written. The chief character is Dr. Primrose, a worthy but simple-minded country clergyman whose poverty and unworldliness lay him open to petty swindles and misfortunes, which are ultimately righted. Throughout the story the reader is kept in a pure and healthy atmosphere. Though the novel can scarcely be said to have a plot, it gained immediate popularity because it so perfectly expressed the homely English sentiment. Its feeling for nature showed the approach of the romantic movement. It was translated into several continental languages. Its excellence is found in its simplicity, naturalness, truth, sweetness, purity of atmosphere, kindly humor and charming delineation of character, while the moral struggle depicted lacks in strenuousness.

Vichy (*vē'shē'*), a town of France on Allier River, celebrated for its mineral waters. There are 21 springs in or near the city, the water of those outside the town being carried in by aqueducts. All the springs, whether hot or cold, are strongly impregnated with soda. The water is clear, with an alkaline taste. The bath-houses can furnish 3,500 baths a day. There is a large trade in the natural waters, and in the manufacture of salts for artificial baths. The visitors often number 15,000 yearly. Population 14,100.

Vicks'burg, Miss., county-seat of Warren County, on the Mississippi, about half way between Memphis and New Orleans. The city is built on terraces rising from the river, with streets narrow but well laid out. It has 20 miles of beautiful driveways, a magnificent military park of 1,400 acres and a national cemetery wherein repose 16,600 soldiers. Situated in the finest cotton-region of the country, it has a large trade in cotton and manufactories of cottonseed-oil and cake, cotton compresses, a dry dock, rolling-mills, foundries, machine and railroad shops and basket, veneering and furniture factories. Vicksburg was fortified and guns were placed to command the river in the Civil War as early as January, 1861. It was unsuccessfully attacked by Farragut and also by Sherman in 1862, but on July 4, 1863, it surrendered to Grant. Population 20,814.

Vic'tor Emman'uel II, king of Italy, born at Turin, March 14, 1820, was the son of Charles Albert, king of Sardinia. After serving gallantly in the army, he became king of Sardinia by the abdication of his father on the evening of the battle of Novara, March 23, 1849. From the Austrian conquerors of his country he succeeded in obtaining the withdrawal of their demand that the Sardinian constitution be abolished. This liberal constitution, granted by his father, he faithfully maintained, earning by this conduct the title of The Honest King and winning the confidence of the Italian nation. He chose wise counselors, and, with Cavour to guide, made many reforms, took part in the Crimean War, and visited Paris and London. With the help of the French the battles of Solferino and Magenta were fought against Austria, but the peace of Villafranca between Austria and France left Italy still distant from its hoped-for unity. But Tuscany, Modena, Parma and the Romagna voted for annexation to Sardinia, and the Prussian alliance in 1866 gave Venice to Italy. The French withdrew from Rome, and on Dec. 31, 1870, Victor Emmanuel entered Rome and became king of a united Italy. He reigned eight years, dying at Rome, Jan. 9, 1878. Consult *Life* by Dicey and by Godkin and *Italy under Victor Emmanuel* by Arrivabene.

Victor Emmanuel III of Italy, born Nov. 11, 1869, the only son of Humbert I, whom he succeeded on the throne on the assassination of his father, July 29, 1900. His mother is Queen Margherita, daughter of the late Prince Ferdinando, Duke of Genoa. In 1896 he married Helena (born 1873), daughter of Nicholas, Prince of Montenegro, the heir-apparent being Humbert, Prince of Piedmont (born 1904).

A man of unusual intellectual ability, he is particularly interested in mechanics and the fine arts and is a recognized authority on historic Italian coins.

Victoria, a state in the southeast of the Commonwealth of Australia. The population at the present time is 1,412,119. Murray River forms its northern boundary, dividing it from New South Wales, and the ocean its southern one. On the west is South Australia.

Victoria is 480 miles long and about 250 wide, and covers 87,884 square miles. The coast is about 800 miles long with Portland Bay, Port Phillip Bay and, Corner Inlet as harbors. A chain of mountains, called Dividing Range, running nearly east and west, divides it unequally. The eastern part of the range, called the Australian Alps, is from 1,000 to 7,000 feet high, Mts. Hotham, Smith and Selwyn being high peaks. Along these ranges grow gigantic trees. The western part of the range is called the Grampians, where the principal peak is Mt. William. The western part of Victoria is level, with fine pastures for the merino, whose wool brings the highest price in the markets of Europe. Part is covered with timber and reserved as a state forest. Many thousand square miles in the east are unexplored, ..nd more than ten millions of acres are so covered with forest-clad mountains as to be too wild for settlement. The streams are too small for navigation, except the Murray and the Yarra. The climate is fine, about half the year being bright, with a bracing, dry, pleasantly warm atmosphere. The temperature never falls below freezing, except for an hour or two before sunrise, in the coldest month. Snow has fallen only twice at Melbourne, though common on the higher plains and mountains. The disagreeable feature of the climate is the north wind, cold and dry in winter, hot and dry in summer. The trees, among the largest in the world, mostly are *eucalypti* or gum-trees. The white gums are the most beautiful, standing in groves, their long, branchless trunk , as smooth as marble, looking like the pillars of a cathedral. The largest measured was 470 feet long and 81 feet around. Eucalyptus oil comes from the blue gum, and the red gum is used for timber, being almost indestructible. Magnificent ferns and fern-trees are found in the forests. The kangaroo, opossum, wallaby, vardicoot and wombat are among the peculiar animals, all belonging to the marsupials (*q. v.*), and the parrot, cockatoo and laughing jackass or kingfisher are among the native birds. Snakes are numerous, but not venomous. Wheat, barley and oats are the principal crops, and almost all fruits except oranges and bananas are grown. See AUSTRALIA: *Victoria*.

Victoria, Can., capital and seaport of British Columbia and second seaport of Canada. It is on a narrow inlet opening from the Strait of Juan de Fuca into the southeastern coast of Vancouver Island. It is the headquarters of the Canadian fur-sealing fleet. Three miles northwest is Esquimault, connected with it by an electric road. The parliament buildings, beautifully located, and the new hotel of the Canadian Pacific are imposing buildings. Population 31,620.

Victoria, queen of Great Britain and Ireland and empress of India, was born at Kensington Palace, May 24, 1819. She was the daughter of Edward, duke of Kent, and granddaughter of George III. At the death of her uncle, William IV, she became queen on June 21, 1837. On Feb. 10, 1840, she married her cousin, Prince Albert of Saxe-Coburg-Gotha. When she came to the throne, she found Lord Melbourne, under whom her education had been conducted, at the head of her government, where he remained until 1841. His successors have been such men as Peel, Russell, Derby, Palmerston, Disraeli, Gladstone and Salisbury. Under her wise leaders the queen saw the country carried safely through the revolutionary period of 1848, the fall of the French monarchy, the formation of the kingdom of Italy and the German Empire and the Civil War of the United States. Some of the important measures of the period were the adoption of penny postage, abolition of the cornlaws, the transfer of the East India Company's possessions to the crown, the Irish land-act and the admission of Jews to the house of commons. The most disturbing question of the period, which is still unsettled, was the relation of Ireland to Great Britain. The Crimean War, the Indian Mutiny, the Abyssinian War and wars in Egypt, Afghanistan and South Africa were the principal military events of her reign. In 1861 her husband, known as the Prince Consort, died, and the queen lived in partial retirement until 1876, when she again opened Parliament in person. In 1877 she was proclaimed empress of India. The reign of Queen Victoria was the longest and one of the most prosperous in English history. She understood the relation between the crown and the people, did not oppose reforms, and left the government largely in the hands of her ministers, which justified her being considered the most constitutional monarch of Britain. Her home life also was an example to her subjects, and earned the respect of the civilized world. It was altogether fitting that Tennyson should dedicate poems of his to this worthy woman. She was the stalwart friend of the American Union in 1861–5, and her womanly sympathy with the widows of Pres. Lincoln (1865) and Pres. Garfield (1881) endeared her to all Americans. The Boer War of 1899 grieved her deeply. She had nine children, the oldest daughter being the late Empress Frederick of Prussia, and the oldest son, Albert Edward, who reigned as Edward VII. The queen's jubilee was celebrated in

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1887 and the diamond jubilee in 1897. She died on Jan. 22, 1901. Consult *Life of the Prince Consort* by Martin; *Leaves from the Journal of Our Life in the Highlands* by Queen Victoria; *Life* by Greenwood; *History of Our Own Times* by McCarthy; and *Journal of Victoria's Reign* by Greville. See England, Ireland, Great Britain and Scotland.

Victoria Nyanza (*ni-ăn'ză*), one of the great fresh-water lakes of Africa, is crossed by the equator, and is about 3,308 feet above the sea. *Nyanza* merely means a large body of water. The lake was discovered by Speke, the African traveler, in 1858, and he explored the western and northern shores in 1862. The lake flows into a beautiful river, with cataracts, called Ripon Falls, Karuma Falls and Murchison Falls, the last, a descent of 120 feet, entering Lake Albert (*q. v.*) after a journey of 100 miles. This river is now called the White Nile, but Lake Victoria is not considered the source of the Nile.

Victoria University, Can., was formerly at Cobourg, Ontario, representing the Methodist body, but has federated with the University of Toronto. The governing body is represented on the senate of the University of Toronto, its graduates elect representatives to the same body, and by the removal of the faculty and students to Toronto, where college buildings have been erected in the northern part of Queen's Park, a union of the universities was effected. The theological colleges also formerly in affiliation with the University of Toronto have become federating colleges, and enjoy increased representation on the senate. Dr. Burwash is president of both faculties, — arts and theology. Victoria has for many years been one of the most useful educational institutions in Canada. Her graduates by the hundreds are to be found all over Canada, honorably filling important positions. Victoria has trained some of the ablest and most influential ministers of the Methodist church of Canada. The average yearly attendance of students in theology is 150.

Vien'na, the capital of the Austrian Empire, is on the Danube River. An arm of the river, called the Danube Canal, passes through the city, and a little stream, the Wien, flows into it and gives its name to the city. Vienna is in a plain, bordered by hills, belonging to the Styrian Alps. There are two parts — the old town, and the suburbs. The streets of the old town, run to a point in the center, like the spokes of a wheel. Between the old town and the suburbs is an open space, from 600 to 1,500 feet wide, turfed, shaded with trees and laid out in walks, which occupies the place of the old wall and fortifications. The suburbs, 36 in number, completely surround the old town and are encircled by a wall 12 feet high, with 13 gates, called the "lines" of Vienna. Another wide boulevard goes around the city, which is 16 miles in circumference. The old town is the most fashionable part of the city, and contains the palaces of the emperor and nobility. The people live in flats, none but the richest nobles occupying a whole house. The apartment houses, called *zinspaläste* (tenement palaces), are many of them finely adorned with statues and other ornaments, and are quite a feature of Vienna. Other modern buildings are the museums of art and natural history, the palace of justice, the houses of parliament, the new court-theater, and the new opera-house, one of the finest in Europe. The most important of the old buildings is the Cathedral of St. Stephen, one of the finest specimens of Gothic architecture in Europe, with a tower 450 feet high, the catacombs where the emperors are buried and the tombs of Frederick III and Prince Eugene of Savoy. The imperial palace dates from the 13th century, though additions have been made to it at various times. It has a library of 400,000 volumes and fine collections of antiquities and curiosities. The University of Vienna, established in 1365, has 512 teachers and 8,108 students. There also are two theological seminaries, a conservatory of music, a military school, an academy of science and an academy of art. The academy of art, the Belvedere palace and some of the private galleries of the nobles have very fine collections of paintings, antiquities, and armor. The Prater is a great park of 2,000 acres on the east of the city, where the great exhibition of 1873 was held. Vienna has a large grain-trade, and also exports wine, cattle and manufactured goods, such as carriages, iron ware, and cotton and silk goods, rivaling Paris in its leather and fancy goods and being noted all over the world for its meerschaum pipes and bent-wood furniture.

Probably Vienna originally was a Celtic settlement. It was taken by the Romans, called Vindobona, and made a military post. In 180 Marcus Aurelius died there. Attila and his Huns occupied it for a time in the 5th century; the crusades made it prosperous by the large trade they brought to it; and in 1276 it became the capital of the Hapsburgs. It was besieged by the Hungarians in 1477, taken by Matthew Corvinus in 1485, defended bravely against the Turks in 1529, and again in 1683. It was the meeting-place of the congress of Vienna in 1814, where the affairs of Europe were settled after the downfall of Napoleon. Population, 2,030,850.

Vil'lafran'ca, a town of Italy, nine miles south of Verona. Its chief industry is the silk-trade. It is known as the scene of several battles, including the defeat of Charles Albert, king of Sardinia, by Radetzky, the Austrian general, July 25, 1848. and of the Italians by the Austrians, June 24, 1866. It is also noted as the place where (July 11, 1859) the emperors Napoleon III and Francis Joseph signed the treaty which gave Lombardy to Victor Emmanuel, called the Peace of Villafranca. Population 9,729.

Villars (*vē'lär'*), **Claude Louis Hector,** Duke of, a French general, was born at Moulins, France, May 8, 1653. His first service was in Holland and Germany. During the time of peace he was sent as an ambassador to Vienna and Munich. In the War of the Spanish Succession he captured Kehl, defended the northeastern frontier of France against Marlborough, and took several towns in Alsace. He was defeated at Ramillies and wounded at Malplaquet. His brilliant campagn in 1712, in which he defeated the Austrians at Denain, compelled Prince Eugene to raise the siege of Landrecies, and took several towns; and brought about the Peace of Utrecht (1713) and the Peace of Rastadt (1714). When more than 80 years old, in 1733, when the war with Austria began, he was given command in Italy, but soon asked for his recall, and died on his way home, at Turin, June 17, 1734. He was made marshal-general of France by Louis XV, a rank before conferred only on Turenne.

Vill'iers. See BUCKINGHAM.

Vincennes (*vĭn-sĕnz'*), **Ind.,** an old, settled, historic city, the capital of Knox County, on the Wabash River, in southwestern Indiana, 50 miles north of Evansville and about 105 miles southwest of Indianapolis. It is served by four railroads, and has a number of fine parks and public buildings. From 1800 to 1813 it was the capital of Indiana, and originally had been a fort, erected in 1702 by the French. After its capture by the English in 1763 and their actual possession in 1777, this fort became a "bone of contention." The valiant Geo. Rogers Clark (*q. v.*) of Kentucky and his Virginians, assisted by the Ohio Valley French, secured this prize, and by this means brought the great middle west to the United States. Here is the seat of Vincennes University, with 300 students, the St. Rose Academy for girls, modern public schools, enrolling 3,500, and a public library. Vincennes University was founded in 1806, and the first school in Indiana was founded in Vincennes by Father Rivet, and the first church built in the Northwest Territory was erected here in 1742 by Father Meurin. Vincennes has a number of industries, including flour and woolen mills, packing houses, brick and tile works, carriage and furniture factories, agricultural implements and machine shop products. Population, 19,500.

Vin'cent, John Heyl, bishop of the Methodist Episcopal church and chancellor of the Chautauqua system, was born at Tuscaloosa, Ala., Feb. 23, 1832, and educated at Lewisburg and Milton, Pa., and in the Newark (N. J.) Wesleyan Institute. After this he removed to Illinois, and there held charge at Joliet, Galena, Rockford, Mount Morris and subsequently at Chicago. Here he founded the *Sunday-School Quarterly* and the *Sunday-School Teacher*, containing the lessons that have become international. With Lewis Miller of Akron, O., he established the Chautauqua Assembly in 1874, and four years later founded also the Chautauqua Literary and Scientific Circle, of which he has since been chancellor. He has been preacher at Yale, Harvard, Cornell, Wellesley and other colleges, and is the author of *The Chautauqua Movement, The Church at Home, Our Own Church, The Modern Sunday-School, The Church School and Sunday-School Institutes* and *Earthly Footsteps of the Man of Galilee.*

BISHOP VINCENT

Vinci (*vĭn'chē*), Leonardo da, an Italian painter, was born at the Vinci palace near Florence, Italy, in 1452. He was celebrated as painter, architect, sculptor, musician, scientist, engineer and mechanic, anticipating many of the great discoveries of astronomy and geology. He founded an academy of art; executed a model for an equestrian statue of Francesco Sforza; traveled through Tuscany as an engineer and architect; and designed the canal of Martesana at Milan. His celebrated picture, *The Last Supper*, was a fresco in a convent at Milan, now in a damaged condition. The best copy, by one of his pupils, is in the Royal Academy, London, and the most celebrated engraving of it is by Morghen. His *Adoration of the Kings* was painted at Florence, as were several portraits, now in the Louvre at Paris. He went with Francis I as court-painter from Milan to France, where he died near Ambroise on May 2, 1519. Consult *Life* by Clement and *Legends of the Madonna* by Mrs. Jameson. See FINE ARTS (*Italian*).

LEONARDO DA VINCI

Vine. See GRAPE.

Vin'egar is a weak form of acetic acid, generally produced by fermentation of the juices of fruit, which have already undergone alcoholic fermentation, and varying in flavor according to the material from which it is made. In Great Britain vinegar is usually made from malt, which is fermented in casks, which are three quarters full, with holes for the entrance of air. They are kept at a certain temperature (about 70°) and the process may take weeks or months. The vinegar is then filtered and cleared. What is known as the German rapid process consists in pouring the malt or fermented wort in a shower on to shavings in a cask, and drawing off the liquid and pouring it in again, repeating the process until the vinegar has the right degree of acidity. Wine vinegar is largely made in France and other wine-producing countries from the poorer wines and the lees or settlings of the wine vats. It is white or red, according to the color of the wines used. In the United States cider vinegar is considered the best, and the process essentially is the same as that used in making malt vinegar, warmth and exposure to the air being the two necessary conditions. Home-made vinegar is often produced by putting what is known as the vinegar plant or mother into a weak solution of sugar or molasses. The vinegar plant is found in old vinegar barrels, and is a fungus growth similar to the yeast-plant. The word vinegar means sour wine. See FERMENTATION.

Vi'olets, a class of well-known plants, found mainly in temperate regions. There are over 200 species, which are sometimes divided into stemless and leafy-stemmed violets. The common violet, found wild in the United States in pastures and woods, has heart-shaped leaves and flowers usually light or dark violet, though there are white and yellow varieties. The round-leaved violet, found in the northern woods with yellow flowers, the sweet white violet, the larkspur violet, arrow-leaved violet, Canada violet etc. are among the many varieties. The English violet is prized for its fragrance, and is cultivated extensively for winter bouquets. The most showy and popular variety of the violet is the pansy or tricolor, which has been introduced from Europe. Its irregular-shaped flowers, with their beautiful coloring, in white and shades of purple and yellow, are among our commonest garden flowers. They are said to have been first raised about 1810 by Lady Mary Bennett from a common weed. They are called pansies from the French word *pensées* (thoughts), heartsease, none-so-pretty, love-in-idleness, Johnny-jump-up and kiss me at the garden gate.

Vi'olin', a stringed instrument, which is played with a bow. It is a hollow wooden box, made from pine and maple or sometimes deal and sycamore wood, with a solid handle, and is strung with four strings. The bow is strung with horsehair, and when drawn across the strings sets them in motion. The different notes of the musical scale are produced by stopping the strings with the fingers on a fingerboard on the handle. The quality of a violin depends upon the fineness and thinness of the wood, the curvings and arches, the strings, the varnish, the shape of the sound-holes or openings etc. The best violins were made at Brescia, Cremona, Mantua, Milan and Venice, where, on the southern slopes of the Alps, could be found the fine elastic pine best adapted to the purpose. Salo, Maggini, the Amati family, Joseph Guarnerius, called Gesu, and Stradivarius are among the most celebrated violin makers of Italy; Norman was the first English maker of violins; and Jacobs and Kloz are well-known among German artisans. The greatest of all violin-makers is Stradivarius, born in Cremona in 1644. He learned his trade of the Amati family, but made such improvements that all violins since, whether good or bad, are copies of his work. A fine violin of his manufacture will bring from $1,500 to $3,000. The Cremona varnish, very fine, brilliant, clear, and red or brown in color but in its most beautiful form resembling amber, was used by these Italian artists, but the secret of its manufacture or the mode of applying it seems lost. The viol was the original of the violin. It was a stringed instrument with from five to 15 strings, and the finger-board was divided by frets — strips of metals — as in the guitar. The viola and violoncello are varieties of the violin, called also tenor and bass viols. The violin is also called fiddle, from the Anglo-Saxon *fythel.* Violins are now made mostly in France and in Saxony. See STRADIVARI.

Vi'per, the common name for several very poisonous snakes of the Old World. They have a triangular head and a robust body. The European viper, often called the asp, is widely distributed in Europe. It is about two feet long, of yellowish brown color, with black spots. In England, a similar form, commonly called the adder, is the only venomous reptile known to inhabit Great Britain. In Africa the most common variety is the horned viper with a horn-like scale over each eye. It lies partly hidden in the sandy wastes of northern Africa, awaiting its prey. It is possible that this is the asp used by Cleopatra in committing suicide. There are two vipers in India, one about 20 inches long and the other about four feet long.

Vir'chow (*fẽr'kō*), **Rudolph,** a German physician and pathologist, was born in Pomerania, Oct. 13, 1821. He studied medicine at Berlin, and lectured on anatomy in the university there. In 1848 he became a leader of the Liberal party and was elected to the Prussian house of deputies, losing his position in the university because of his liberal ideas. He was appointed professor of anatomy at Würzburg in 1849, and in 1856 he was called back to Berlin, put in charge of a medical institute, and given the chair of pathological anatomy in the university. The Prussian government sent him in 1848 to Silesia, to study the typhoid fever that was prevailing there; and the Bavarian government, in 1852, asked his aid in ascertaining the causes of a famine fever; while the king of Sweden begged him to investigate the leprosy that was prevalent in the western part of Norway. He was a member of the German Congress and for a long time an alderman of Berlin. He distinguished himself in a number of different fields of learning. He is recognized as the originator of cellular pathology, and, on account of the general bearing of his studies, as one of the founders of modern biology. After 1856 he was director of the Pathological Institute, Berlin. He published a large number of scientific papers, a handbook of *Special Pathology*, one on *Cellular Pathology* etc. On his seventieth birthday, Oct. 13, 1891, he was given a public reception, attended by thousands of his friends and former pupils. He died on Sept. 5, 1902.

Vir'eo or **Green'let,** a class of birds somewhat like the shrikes. They are found in America, migrating usually in May from South America to the United States. They are very destructive to insects, and are sweet singers. The color usually is a shade of green, with white markings. They build their nests in trees and bushes, hanging them from twigs and making use of pieces of hornet-nests, flax and paper, which they glue together with the silk from the caterpillar or the saliva of birds. The nests are so strong that other birds and even mice will use them after they are deserted by their owners. The red-eyed vireo, the white-eyed vireo, the solitary vireo and the Whip-Tom-Kelly are varieties found in the United States.

Virgin'ia is one of the thirteen original states of the Union. It is a rough triangle in shape, with its broad base resting on North Carolina and Tennessee, running along Kentucky and West Virginia on its western side, and having Maryland and the Atlantic Ocean on the eastern side. Its longest line from east to west is 476 miles and from north to south 192 miles; the whole area being 40,125 square miles.

Surface. It has a hilly region and a region of lowlands, as the southeastern part is a broad, undulating plain, nowhere rising more than 800 feet, while the northwestern part has parallel mountain ranges, reaching 5,700 feet in their highest points, with valleys between. The region next the Atlantic on Chesapeake Bay, called Tidewater Virginia, is divided into five great peninsulas, with hundreds of smaller ones, giving a coast of nearly 2,000 miles. This region, going inland 100 miles, only rises from 12 to 100 feet above the sea. Midland Virginia and Piedmont are two of the six steps by which Virginia rises gradually from the seashore to the Appalachian Mountains and reaches to the fourth rise, the Blue Ridge country, which is diversified by the two portions of the range and the fine tablelands, at heights varying from 916 to 5,700 feet. The valley of Virginia, the next step, 300 miles long, is a part of the great Appalachian valley stretching from Canada to Alabama, and lies between the Blue Ridge and the Kittatinny or North Mountains. With its broad valleys, its mountain chains and rivers it forms one of the finest regions in the United States. The Appalachian region has high mountains and deep, trough-like valleys, and forms the grazing and timber region of the state, while beyond lies the Virginian portion of the tableland stretching westward from the Alleghanies, which is the coal-region. The highest peak in Virginia is Mt. Balsam (5,700 feet) on the border of North Carolina.

Drainage. The Potomac, Rappahannock, York and James, with their tributaries, flow into the Atlantic through Chesapeake Bay. The Great Kanawha flows into the Ohio, and other small rivers into the Tennessee. The climate is as varied as the country and its resources. The state is noted for its clear skies, pure air and freedom from great storms.

Natural Resources. Virginia has great forests of balsam, pine and other trees, which are being rapidly exhausted. It also has valuable fisheries, especially of oysters, and the mineral wealth is considerable, but as yet not extensively developed. The output, however, is valuable. Among the varieties worked are marble, granite, sandstone, limestone, slate, coal, iron, talc, soapstone, titanium, gold, silver, lead, zinc and copper. There are some gold-mines in the belt which extends from Washington to Halifax Court House, 200 miles long and from 15 to 25 wide, and the manganese mines are the largest in the world. Salt is obtained from artesian wells, which reach a solid bed of salt. There are many mineral springs, some of which, notably the White Sulphur, have long been popular as summer resorts. The Natural Bridge, with a span of 80 feet, 215 feet high and 100 feet wide, is one of the remarkable natural arches of the world. The caverns of Luray, Weyer's cave and Madison cave, the Crabtree falls, descending 2,000 feet, and the Dismal swamp, covering 150,000 acres, are among the scenic features.

Manufactures. The manufactures include extensive iron and steel works, flour-milling, lumber and its products, paper and pulp, glass, trunks, leather-goods, railroad-cars, foundry and machine-shop products, chewing and smoking tobacco (*q. v.*) and snuff, cigars and cigarettes, stemmed tobacco, fertilizers and cotton-goods.

Agriculture. The cultivation of early vegetables and small fruits for northern markets is among the profitable employments. Corn and tobacco are grown in all portions of the state, and wheat, oats, hay, buckwheat, rye and barley are also produced in large quantities. Peanuts are the leading crop in the low, coastal region, orchards and vineyards in the middle regions, and in the higher portions are the pasture-lands and cattle-farms. The live-stock industry brings more money to the farmers than does tobacco, and the dairy-products but little less. The value of the poultry and eggs almost equals that of the dairy-products. Only a small portion of the state is devoted to cotton-raising. Sumac-leaves and oil of sassafras are peculiarly Virginian products.

Education. The free public school system dates from 1870 and is under the direction of a state superintendent of education and the state superintendent, under whom are special superintendents for different divisions of the state. In addition, there are district and county school boards. There are five public normals and one private normal. The College of William and Mary, now used as a state normal school, for more than a century was one of the principal southern colleges and stands next to Harvard in age, being the second college founded in the United States. The University of Virginia (*q. v.*), near Charlottesville, owes its existence mainly to Jefferson. The old buildings were designed by him. It has a museum of natural history, a Gothic chapel, an experimental farm and an observatory with one of the largest telescopes in the world. Washington and Lee University, first named Washington College in honor of Washington, who endowed it with property given him by the state, after being presided over for five years by Robert E. Lee received its present name from the legislature. Hampden-Sidney College, Emory and Henry College, Randolph-Macon College (for men, at Ashland; for women, at Lynchburg); Roanoke College, Virginia Military Institute, Virginia Agricultural College, with the United States experiment station, and St. John's Theological Seminary are other institutions of higher learning. There are theological seminaries for white students at Richmond and Alexandria and for colored students at Richmond, Lynchburg and Petersburg. The University of Virginia has a medical department, and there are two other medical colleges. For the higher education of the negro there are Hampton Normal and Agricultural Institute at Hampton (*q. v.*), Hartshorn Memorial College (female), Virginia Union University at Richmond and Virginia Normal and Industrial Institute at Petersburg. This is supported by the state. Separate schools are maintained for the white and the colored race, and no child under 12 can be employed in any mining or manufacturing work.

Institutions. There are national cemeteries at Arlington, Ball's Bluff, Culpeper, Fredericksburg and Richmond; a navy-yard and naval hospital at Gosport; an artillery school at Fortress Monroe; and a home for disabled volunteers at Hampton. There are charitable institutions for the aged and orphans at Richmond, a state school for the deaf, dumb and blind at Staunton, insane asylums (for whites) at Williamsburg, Marion and Staunton, with one for colored at Petersburg. There are a soldiers' home at Richmond, an industrial school for boys at Laurel and a state penitentiary at Richmond.

History. The whole country from Cape Fear to Halifax, Nova Scotia, was first named Virginia, in honor of Queen Elizabeth (the Virgin queen), after its discovery by Raleigh. The first permanent English settlement in America was made at Jamestown on May 13, 1607. The London Company, under whom the colonists had been sent out, by charter from James I held the land for 400 miles along the coast and 400 miles back into the interior and all islands within 100 miles of the coast. In 1619 negro slavery was brought into the United States by the sale of 20 slaves brought to Jamestown in a Dutch man-of-war. In 1754 Virginia established a fort at Pittsburgh on the Ohio, which was taken by the French, and the French and Indian War followed, ending in the treaty of 1763, which left the Mississippi as Virginia's western boundary. In 1784 the state ceded all the land beyond the Ohio to the United States on condition that slavery be prohibited in the new states formed out of the territory. In the War of Independence and in that of 1812 Virginia was prominent, giving the head to the Revolutionary army and also the first president to the new republic in the person of Washington, whose home, Mt. Vernon, on the Potomac, has been presented to the nation. In the Civil War Virginia at first refused to secede, but later joined the southern confederacy, losing thereby the western part of the state, which refused to secede. The state suffered more than any other in the Union, being the most important battleground of the country, on which were fought some of the most destructive contests of the war, which ended on the soil of Virginia at Appomatox Court House, as had that of the Revolution by the surrender of Cornwallis at Yorktown. The chief cities of Virginia are the capital, Richmond (population 127,628) and Norfolk (67,452). Population of the state

2,202,522. Consult *History of Virginia* by Magill; *History of Virginia* by Burke; and *Early Settlement of Virginia* by Neill.

Virginia City, Mon., county-seat of Madison County, on the eastern slope of the Rocky Mountains, 110 miles south of Helena. It was the capital of the territory for ten years. It was settled in 1863, when gold was found in the Alder gulch, one of the famous mining-regions in the world. This district has since yielded $50,000,000 worth of gold. Population 467.

Virginia City, Nev., county-seat of Storey County, about 180 miles northeast of San Francisco. It is on the steep slope of Mt. Davidson, about 6,300 feet above the sea. It is built over the great Comstock lode (*q. v.*), the largest mineral vein in the world. The city was founded in 1859, and grew rapidly with the influx of gold-seekers, until in 1875 it had 15,000 inhabitants. Since the decline in the price of silver the town has steadily decreased in size, and the present population is only 2,224 The Comstock lode was discovered by a Virginian and this fact has given the name to the city. The town has a library, churches, schools and newspapers, and has electric and gas plants and, for domestic and mining purposes, a daily supply of 10,000,000 gallons of water.

Virginia Creep'er, a vine belonging to the grape family. It is found in North America, and known by its glossy five-parted leaves, which become a bright scarlet in the fall, and its dark-blue berries. It grows 50 feet or more, clinging by tendrils to old walls and trunks of trees. It is also called American woodbine and American ivy, and is sometimes mistaken for the poison-ivy. It can be distinguished easily by its five-parted leaves from the poison-ivy, which has three-parted ones. A Japanese variety of the American creeper has been introduced, with variegated leaves, which is very popular, and hardy as far north as Boston.

Virginia, Minn., a city, in St. Louis County, on the Great Northern, Duluth and Iron Range, the Duluth, Rainy Lake and Winnipeg and the Duluth, Missate and Northern Railroad, 55 miles northwest-west of Duluth. Founded in 1893, it received its charter as a city in the following year. Besides the agricultural resources of the region, there are over a score of iron-mines in the vicinity. Its industries embrace foundries, car and machine shops, and several lumber-mills. Its public buildings, besides a city-hall, include the Lenont Hospital, a Carnegie Library and the Roosevelt High and Technical School. Population, 14,420.

Virginia, University of, an institution of higher learning (undenominational) at Charlottesville, Va., near Monticello, the home of Thomas Jefferson, who was much interested in it and was its rector (1819–26). It has an attractive group of buildings, planned by Jefferson, its rotunda being modelled after the Roman Pantheon. To-day the university comprises 25 schools, grouped into two academic and four professional departments, its courses being purely elective. It awards no honorary degrees, only those conferred upon examination after residence. These embrace the degrees of bachelor of arts and master of arts, doctorates of philosophy, law and medicine; it also gives courses in civil, mechanical, electrical and mining engineering. It has an income of about $160,000 yearly. It has 725 attending students, with 75 professors and instructors. Its library contains 60,000 volumes.

Vir'gin Islands, a group of over 30 islands lying east of Porto Rico, in the West Indies, with an area of 58 square miles. About one fourth of them are inhabited. Sugar, molasses, cotton, salt, turmeric, pimento and ginger are among the products. Most of the islands belong to Great Britain, and since 1872 are included with the Leeward Islands, the president of the British Virgin Islands being under the authority of the governor of the Leeward Islands. The other islands of the group belong to Denmark, except Crab Island, which is owned by Spain. Columbus discovered the islands in 1494. They were secured by Britain by settlement in 1635, shortly after the British occupation of the Bahamas. The chief town is Roadtown on Tortola Island. The other principal islands of the group are Anegada and Virgin Gorda. To Denmark belong Santa Cruz, St. Thomas and St. John. Population 4,691.

Virgin Mary. See MARY.

Viscos'ity of Liquids, a term employed in physics to describe a kind of friction between the particles of a liquid when the various parts of the liquid are moving with different velocities. If a surface of area, A, in the liquid be chosen in a plane parallel to one of the fixed walls of the vessel, then the viscosity of the liquid is expressed as follows: Let V denote the velocity with which the liquid is moving at the surface A; and let D be the distance from the surface A to the fixed parallel wall.

Then if R is the tangential resistance experienced by the plane A,

$$R = \frac{n\,A\,V}{D}$$

where n is a constant for any one liquid and is called the *coefficient of viscosity* for that liquid. This coefficient is the measure of the viscosity of any liquid. It is the viscosity of water that causes waves to die down after a storm.

Vish'nu, one of the Hindu gods, belonging to their trinity, which consists of Brahma, the creator; Vishnu, the preserver;

and Siva, the destroyer. In the *Rig-Veda*, a sacred book of the Hindus, he is considered to represent the sun. In his character as preserver of the world he has descended several times, to set it right. These appearances are called *avatars*, in which the god is supposed to have taken the form of some animal, god or man. There usually are ten of these *avatars* mentioned, such as the man, the lion, the fish, the dwarf, the Buddha. One more appearance is looked for, when the close of the present age shall be nigh. Vishnu is represented with four hands, holding a shell to be blown in battle; a disc, an emblem of power; a mace, a symbol of punishment; and either a lotus flower or a sword. He is sometimes represented floating on a serpent, seated on a throne, or riding on an animal half bird and half man. Consult Moor's *Hindu Pantheon*.

Vis'igoths. See Goths.

Vision (*vĭzh'ŭn*). See Eye.

Vis'tula, a river of Europe which rises in Austrian Silesia and, crossing Russian Poland and Prussia, flows into the Baltic Sea at Dantzic. It is navigable to Cracow, 550 miles, and 100 miles below its source. At Vistula in Silesia there are falls of 200 feet.

Vladimir (*vlăd'ĭ-mēr*) **the Great,** a Russian ruler, who reigned from 980 to 1015. He added largely to the kingdom by conquest, but is best known for the introduction of Christianity into the Empire. He embraced the doctrines of the Greek church, and was baptized at Constantinople in 988, the day after his marriage to the sister of the Byzantine emperor. He died in 1015.

Vladivostok (*vlȧ'dyĕ-vȧs-tŏk'*), the chief naval station of Russia in Siberia, is on the Gulf of Peter the Great in the Sea of Japan. It is situated on the point of a peninsula called the Golden Horn, on a strait named the Eastern Bosporus, with one of the finest harbors in the world. The climate is severe, but the gulf is frozen only along the shores, even in December. The navy workshops have been established at Vladivostok, which, with the discovery of gold in the neighborhood, has increased the importance of the place. Some 3,000 or 4,000 Koreans are employed in gathering seaweed, which is sent to the Chinese markets. The city is connected by submarine cable with Nagasaki and Shanghai; and in 1897 that section of the great Siberian railway (*q. v.*) was completed which brought Vladivostok into communication with the rest of the Russian empire. There also is a series of military posts and telegraph lines. Population 90,162.

Vo'cal Mem'non. On the western side of the Nile near the temple of Luxor we find the ruins of the *Memnonium* or great temple of Amenophis III. Very little is left; but two huge, seated colossi 60 feet high of Amenophis III still remain in defiant grandeur. These statues attracted little or no attention until 27 B. C., when the upper part of one was broken off by an earthquake, and after that it was observed that the remaining bulk gave forth a prolonged wail when wet with morning dew and warmed by the rays of the rising sun. The vocal Memnon became a great factor in Greek mythology, as the Greeks and Romans were frequent travelers in Egypt in those days. See Temple of Karnak and Temple of Luxor.

Vogt (*fōgt*), **Karl,** a German naturalist, was born at Giessen, July 5, 1817. At Neufchatel he studied natural history for five years under Agassiz. He was made professor of natural history at Giessen in 1847, but lost his position and had to leave Germany because of his zeal in the revolutionary movements of 1848. In 1849 he was made professor of geology at Geneva, and held that position to the time of his death, May 6, 1895. He claims to have written the first volume and a part of the second of Agassiz's *Natural History of Fresh-Water Fishes*. He also wrote *Studies in Geology and Petrifactions; Man, His Place in Creation and in the History of the Earth; Essays on the Darwinian Theory;* works on physiology, zoology, anthropology and geology; and many scientific papers. His work on *Faith and Science*, published in 1855, is best known, and has been severely criticised for its supposed atheistic tendencies.

Voice is the sound produced by the movements or vibrations of the vocal cords in the larynx. The larynx is in the neck, between the trachea or windpipe and the pharynx, that part of the throat directly behind and below the mouth. The vocal cords are two elastic bands fastened across the larynx between which the air from the lungs passes out. The arrangement resembles two strips of india-rubber stretched across the mouth of a glass-tube, into which air is forced by a bellows, which would cause the edges of the rubber strips to vibrate with sufficient rapidity to produce a sound, the pitch depending upon the number of vibrations in a second. The first thing necessary to produce a sound is the expulsion or driving out of the air through the glottis or opening between the vocal cords; and the second necessary condition is that the cords should be close enough together and tight enough to vibrate rapidly. All the variations between high and low notes are produced by changes in the width of the opening and in the tension or tightness of the cords. If the cords are more than one tenth of an inch apart, there will be no sound. The pitch of the voice, depending upon the number of vibrations in a second, is determined by the length, size and tension of the cords. The pitch of the male voice is lower than that of the female voice, because the cords are longer. A boy's voice breaks and falls about an octave at the period of life when the cords lengthen; and in old age the voice changes, because the muscles which move the cords lose their elasticity. Hoarseness is caused by roughness or swelling of the cords. The ordinary range of the voice is two octaves, while the ear can perceive musical tones for 11 octaves. The quality of the voice depends upon the strength and elasticity of the vocal cords and also upon the shape of the passages of the ear, throat and mouth through which the sound passes, a slight difference in these respects causing the same varieties of tone etc. in the human voice as in a musical instrument. Voice differs from speech, which is the production of sounds to express ideas. Animals have voice without speech. In speech the tones produced by the voice are changed by the action of the organs of the throat and mouth, as the tongue, lips, teeth palate etc., into a large number of simple sounds, which, put together, form words. These vocal sounds are divided into vowels and consonants, the different combinations of which produce the hundreds of thousands of words which form the languages. See *Human Physiology* by Carpenter and *Voice, Song, and Speech* by Browne and Behnke.

Vol'apük' is the name given to an artificial language which Johann Schleyer of Baden invented in 1879. It was intended for use as an international speech. The words which form the vocabulary of Volapük are constructed from an aggregate of words belonging to the different European languages, especially English. In order that the language may be easily learned, local elements and inflexions are discarded. Austria was the first nation to welcome Volapük to any considerable extent, and the language soon spread to France, the Netherlands, America and England. The weakness of Volapük is that it begins without a history; and, therefore, without authority. Thus its usefulness is diminished by the large number of modified and rival world-languages, which have been stimulated by the example of its success. In Volapük there are 27 sounds, represented by a ä e i o ö u ü b c d f g h j k l m n p r s t v x y z. Most of these letters have their usual continental values; but c is like English j in *jib*, h like the final ch in German, j like the English sh, v like the English w in *we*, y like the English y in *you* and z like the English ts.

The words in Volapük are formed from the simplest roots; and may be built into compound forms by prefixes and suffixes which have a constant value. Thus *ik* is the adjectival affix; *ön* the infinitive affix; and so on. Nouns are inflected in the genitive, dative and accusative singular by adding a, e and i respectively; and in the nominative, genitive, dative and accusative plural by adding respectively s, as, es and is.

In 1884, 1887 and 1889 international Volapük conferences were held; and a controlling academy was established in 1887. The directors of this academy during 1893–1903 were, first, Mr. W. Rosenberger and, afterwards, the Rev. M. A. Holmes. Under their leadership the academy modified Volapük into *Linger International* or *Idion Neutral*. The literature on Volapük in English includes Dornbusch's *Abridged Grammar of Volapük;* Sprague's *The International Language;* Seret's *Grammar with Vocabularies of Volapük;* and Hain's *Grammar of Volapük*. See ESPERANTO.

Volca'noes, vents in the earth's crust from which lava is ejected. The lava may flow out quietly, or it may be ejected forcibly. In the latter case much or all of it may be solid. Small fragments of solid lava are called cinders, but if they are as small as particles of fine sand or dust, they are called ashes. Volcanic ash does not, however, imply combustion. It is nothing more nor less than powdered lava. Besides the lava which issues from volcanoes, either in the liquid or solid form, many gases or vapors escape from the vents. Among the latter vapor of water is most abundant. Steam is, indeed, the principal force in the violent expulsion of materials from volcanoes of the explosive type. Chlorine and sulphur and various compounds of these substances are among the commonest fumes escaping from volcanic vents. Carbonic acid gas is also one of the common gases. Many of the gases are noxious, so that it is sometimes difficult to approach the openings whence volcanic products issue.

The solid material and the liquid lava which escape from volcanoes accumulate about the vents, and build up volcanic cones. In the top of a volcanic cone there generally is a depression, the *crater*, in the bottom of which the vent is situated. When a volcanic cone becomes high, the lava may break through its sides instead of flowing over the top. Cones built up by lava flows have low slopes, often less than 5°, and rarely so much as 10°; cones built up by cinders often have steeper slopes, but rarely more than 25° or 30°. When a volcano ceases to be active, it is said to be extinct, if the quiescence be permanent. When it becomes extinct, however, it really ceases to be a volcano. When the activity of a volcano is temporarily suspended, the volcano is said to be dormant; but it is often difficult to tell whether a volcano is extinct or only dormant. Vesuvius was thought to be extinct until the time of its destructive eruption in 79 A. D. When this occurred, it was seen that the volcano had been dormant only instead of dead. A volcanic vent often continues to give off vapors and gases long after the lava ceases to issue. Vapors and gases also escape, and often in quantity, during periods when no lava is ejected.

When volcanoes cease to be active, their craters may be occupied by water, giving rise to crater lakes. Such a lake, Crater Lake, exists in Oregon. Volcanic cones retain their perfect form for a short time only. Erosion by rain and melting snow soon modifies them. Volcanic cones in all stages of degradation occur in many mountainous regions. Mt. Shasta in California, Mt. Ranier in Washington and San Francisco Mountain in Arizona may serve as examples of volcanic mountains in process of degradation. In southern California and northern Arizona there are volcanic cones so recently formed that they have been modified scarcely at all by erosion. In many of them the craters are still preserved. These fresher cones are largely of cinders.

Volcanoes are often associated with earthquakes, and the violent eruptions of volcanoes are often the direct cause of earthquakes. In many cases, however, it may be true that the two phenomena, the earthquakes and the volcanic eruptions, are to be referred to a common cause rather than either to the other. In the explosive eruptions of Vesuvius the quakings are felt for considerable distances from the crater. In many cases of violent eruption the old cones are partly or wholly blown away. Even large parts of the islands where they occur may be demolished. Outside the present cone of Vesuvius there is a remnant of an older cone, partially destroyed in a violent eruption subsequent to its formation. A large part of the Island of Krakatoa was blown away in the eruption of the volcano of the same name.

The great destructiveness of volcanic action is more commonly due to the material blown out than to the lava, which flows out. The flow of lava usually is slow, and in most cases it flows but a short distance before it congeals. But the solid matter may be widely distributed. It was by ashes ejected from Vesuvius that Pompeii, with its 2,000 people, was buried in 79 A. D. Torrents of rain, due to the condensation of the escaping water-vapor, often fall with the ashes, converting them into a sort of hot, fluid mud, and this is sometimes most destructive in its flow. In the Krakatoan eruption of 1883 it has been estimated that bits of pumice and dust were sent up into the air 20 miles. Sent up into the upper air by the violent explosion, some of the dust was carried by air-currents completely around the earth. Large blocks of lava are sometimes hurled miles from the volcano whence they are ejected.

The number of active volcanoes is estimated to be between 300 and 400. About one third of the active volcanoes are situated on the continents, the others on islands. Most of the volcanoes on continents are relatively near their borders, though extinct volcanoes occur at great distances from the coasts. Continental volcanoes are, on the whole, more numerous about the borders of the Pacific Ocean than about the Atlantic. Many islands are really nothing more than the crests of volcanic cones which have been built up above the surface of the water. There are doubtless very many volcanic cones the tops of which are still below sea level. Of such submarine volcanoes little is known. The lava which issues from volcanoes comes from the interior of the earth, but from what depths is unknown. Active volcanoes are more numerous in regions where the formations are relatively young than where they are old. They are thought to occur in regions where the crust of the earth is in movement, that is, where it is either sinking or rising, rather than in regions where it is stable.

No existing volcano seems to have been active for a period of time which would be considered long, as geologists reckon time, though many of those now known have been active since the beginning of the historic period. There however, is reason to believe that all existing volcanoes will in time cease to erupt and new ones will doubtless come into existence. Volcanoes have been more numerous at some stages of the earth's history than at others, but some of the periods of great volcanic activity were early in the earth's history, and some late. On the whole, it cannot be affirmed that volcanic activity has increased or decreased as the history of the earth has advanced.

References: Judd's *Volcanoes;* the topic *Volcanoes* in text-books on geology; Russell's *Volcanoes of North America;* Geikie's *Earth Sculpture* and Dana's *Volcanoes.*

R. D. Salisbury.

Vol'ga, a river in Russia, which rises in the western part of the country in the Valdai Hills, and by a winding course crosses Russia and flows through many mouths into the Caspian Sea. It is the longest river in Europe, being 2,320 miles in length. It is connected by canals with the Baltic and White Seas.

Vol'ta, Alessandro, an Italian physicist, the inventor of the Voltaic cell, was born at Como, Feb. 18, 1745, where also he died, on March 5, 1827. From 1779 to 1819 he occupied the chair of physics in the University of Pavia.

His discovery of the electric pile (as the form of battery which he devised was then and is still called) begins with the division of all conductors into two classes, *viz.*, conductors of the first class, which become electrified by contact, but in such a way that equilibrium is at once established without any permanent current; and conductors of the second class — what we now call electrolytes. Volta's discovery is that, whenever two conductors of the first class are joined in series with a conductor of the second class, an electric current flows through the closed circuit. This phenomenon was first reported by letter to Sir Joseph Banks, then president of the Royal Society, on March 20, 1800, and was read before the Royal Society on June 26, 1800. The centennial of this important discovery was recently celebrated by an electrical exposition at Como. Volta is also the inventor of the electrophorus and of an absolute electrometer. See ELECTRICITY.

Voltaire (*vol-târ'*), **Francois Marie Arouet,** a famous French writer, was born at Chatenay, France, Nov. 21, 1694. His father's name was Arouet. After studying at Paris and in his father's law office, he began his career as a literary man. He spent a year in the Bastile imprisoned on suspicion of having written some verses which reflected on the government, and there finished his *Œdipe*. On leaving prison he changed his name to Voltaire, which is probably an anagram on his original name. His tragedy was successfully brought out in 1718, but *Artémire* was hissed off the stage. On a visit to Holland he met Rousseau, of whom he made an enemy by a sarcastic reply to Rousseau's question: "What is your opinion of my *Ode to Posterity?*" "It is a letter that will never reach its address" was the answer. His visit to England, which was an exile, introduced him to the literary men and the literature of England. Through the favor of Queen Caroline, who headed the list of subscribers, his *Henriade* brought him nearly $40,000, making him independent of the great men in France whose patronage had been so injurious to him. In 1729 he was allowed to return to France where *Brutus*, *Ériphile* and his best play, *Zaire*, were produced at intervals. His *English Letters*, reflecting on everything in church or state in France, under the pretense of praising England, brought out in 1733, was condemned and burned, he himself being safely out of the way in Lorraine, where he lived for 15 years with Madame du Châtelet, writing and studying Newton's *Principia*. His *Mérope* and *Mahomet*, among his best plays, belong to this period, as does his *Age of Louis XIV*.

His life at the Prussian court, as the friend of Frederick the Great lasted three years, with the jealousies, squabbles and court-quarrels which Voltaire always succeeded in falling into. Being refused permission to return to France, he bought Ferney, an estate four miles from Geneva, which was his home for the last 20 years of his life. Here he was visited by many of the most celebrated men of Europe, carried on an immense correspondence, rescued from want and educated a niece of Corneille, interfered in several cases of oppression and injustice, and adopted a young girl whom he had rescued from a convent. After the death of Louis XV he was permitted to return to Paris, and on Feb. 10, 1778, he entered the city after 28 years of exile. He was received with enthusiasm, and crowned with laurel at the theater where his new play *Irene* was produced. He died at Paris, soon after, on May 30, 1778. His works fill about 90 volumes, including the tragedies *Zaire*, *Mérope* and *Mahomet*, which give him a place with the best French dramatists; historical works, which embrace *Charles XII*, *Louis XIV* and *Peter the Great;* and philosophical works, poems, criticisms and miscellaneous writings. See *Life* by John Morley.

Voltam'eter, an electrical instrument, of galvanometer type, for measuring in volts the differences of potential between different points of a circuit of electricity. The various forms of the voltmeter are adaptations, more or less, of the D'Arsonval galvanometer, in portable form; and in experiments with it it will be found that, with a high resistance in the circuit, the current will be proportional to the difference of potential.

Vol'unteers' of America, The, an organization, on the model of the army of the United States, was founded and incorporated in 1896 by General and Mrs. Ballington Booth to religious and philanthropic work akin to that done by the Salvation Army. The Volunteers seek affiliation with the churches and religious denominations of the country, and many Volunteers are practically engaged with the churches in their good and laudable work in most of the chief cities and larger towns of the Union, which are grouped by the organization into sectional or regimental divisions under the control and oversight of 30 principal staff-officers. The scope of the work undertaken by the Volunteers may be gathered from the fact that they maintain reading-rooms in the chief centers, whence Christian literature is distributed in prisons, hospitals, soldier's and children's homes, besides supplying these with Thanksgiving and Christmas dinners. They also maintain boys' fresh-air camps and girls' sewing classes, furnish hospitals with nurses and, where there is need, afford temporary financial relief. For this good work the Volunteers have organized and maintain philanthropic institutions in the principal cities of the United States, in addition to their chief centers of labor in New York, Philadelphia, Boston, Pittsburgh, Denver, Chicago and San Francisco. See SALVATION ARMY.

Voo'dooism, a term referring to beliefs and practices currently considered to prevail among the negroes of the West Indies and the southern United States. But careful research has disproven any organized set of beliefs and ceremonials which could properly be regarded as a voodoo religion. The practices were supposed to have been imported from western Africa. A great snake (Voodoo) was the central figure, communicating with his worshipers only through a priest or priestess, who was held in great veneration by all devotees. Secret nocturnal ceremonies were characterized by prayers to the snake, dancing and the wildest debauchery and indecency. Voodoo doctors among southern negroes were often called to help destroy an enemy, for they were skillful poisoners. Their magic works were performed in secret.

Voorhees (*vŏr'ēz*), **Daniel W.,** an American politician, was born in Ohio Sept. 26, 1827. He studied at Asbury University in Indiana, and began his law practice in that state, where he was appointed district attorney. He was a representative from Indiana for four terms of Congress, became United States senator in 1877, and was reelected in 1885 and 1891. He died on April 10, 1897.

Vosges (*vōzh*), a range of mountains on the left bank of the Rhine, in northeastern France and western Germany. The tops are rounded and called balloons, and are covered with snow for several months in the year. Mines of iron, lead, salt and copper abound.

Vot'ing-Machine, a mechanical apparatus, automatically arranged, for use in voting, and devised primarily in the interest of ballot-reform to lessen fraud in the casting and counting of votes. The introduction of the voting-machine has greatly simplified and shortened casting the vote, and their use in recent years and in various types has been widespread. The authorized use of these devices dates about from 1892, and those now in large use are the McTammany (Massachusetts) ballot-machine; the Myers American ballot-machine, first legalized in New York State; the votograph or American ballot-protector and recorder; the Rhines, first legally used in Michigan; the Bardwell votometer; and the Standard. The methods of working these instruments are various, and on the whole suitable, and are a vast improvement on the old methods of casting paper-ballots. The general principle of all is much the same, viz.: the push-button one; and their advantages, besides those of secrecy and simplicity of voting, include impossibility of multiple voting as well as the prevention of fraud in counting the cast votes.

Vul'can (Greek, *Hephæstus*), in Roman mythology the god of fire, was the son of Jupiter and Juno. He was deformed in his feet from his birth, according to some stories, while others assert that his lameness was due to his being hurled down to earth by Jupiter for interfering in a family quarrel. He fell on the Island of Lemnos, where he built a palace, with a workshop and anvil. He also had a beautiful palace in Olympus or, according to others, in the heart of an island, where with the help of the Cyclops he made the scepter for Jupiter, the armor of Achilles and the weapons of Hercules. There were a temple to him at Rome and a raised square outside the city, called the *Volcanol*, where statues of persons struck by lightning were sometimes placed. There also were several festivals in his honor.

Vul'gate, The, is a Latin translation of the Bible which originated in the second century, probably in the Roman province of Syria. The Vulgate appears to have originated out of a number of different Latin translations which were intended rather for private use than for publication. This being the case, there soon were many Latin versions, which often contained dangerous interpolations as well as corruptions. Accordingly the task of a revision of these versions in the light of the original Greek was entrusted by Damasus, Bishop of Rome, to St. Jerome. The Vulgate of St. Jerome appeared about 384 A. D. Owing to the multiplication of manuscript copies, this text also became very corrupt. Alcuin in 801 and Lanfranc about 1070 undertook revision of it. The best extant manuscript of Jerome's Vulgate is the *Codex Amiatinus* at Florence, which dates perhaps as early as the seventh century. The Vulgate was revised by the authority of the papacy in 1590 and again in 1592. The edition of 1592, known as the Clementine Vulgate for Pope Clement VIII, is the standard Bible in the Roman Catholic church. The most recent critical edition of the Vulgate is that of Wordsworth and White. The Latin of the Vulgate is excellent, and bears the mark of close collation with the Greek version. The language, however, although idiomatic, is not always classical, but occasionally includes later ecclesiastical words and phrases. In some instances it is probable that the Latin version is earlier than the extant Greek. The Vulgate powerfully, though indirectly, influenced the Authorized Version in English, through Wiclif's translation, which was directly from the Vulgate, and through the Douai New Testament.

Vul'ture, the common name for various carrion-eating birds of the Old World. They are birds from two to four feet long, and the largest of them have an expanse of wing from nine to ten feet. Their head and part of the neck are destitute of feathers. There are six species more or less common about the shores of the Mediterranean. Two of these inhabit Africa, and the other four

EGYPTIAN VULTURE

are found in Europe. There the crested black vulture is the type; it is one of the large vultures, reaching a length of nearly four feet. It ranges east through Asia to China and south into northern Africa. Other common species are the griffon, the Nubian or eared vulture and the Egyptian vulture. These birds are called the true vultures; they are closely related to the eagles and to buzzards. A number of American birds, belonging to a different family, are also called vultures. They include the black vulture or carrion-crow, the turkey-buzzard and the California vulture. The American vultures are found chiefly in the southern states. The turkey-vulture or buzzard, a large, blackish-brown bird with a red head, is a very familiar bird of the south, protected by law because of its services as scavenger and its harmlessness, not preying upon barnyard fowls. This bird is gregarious. Large companies are to be seen about rubbish heaps at edge of southern towns or soaring high over fields. The black vulture or carrion-crow also is very common in the south, and is a great scavenger. It is smaller than the preceding, but has a heavier body. Its flight lacks the grace that marks the soaring of the turkey-buzzard. It is very bold, and troops of crows walk about the streets of southern towns. See CONDOR, CROW (CARRION) and TURKEY-BUZZARD.

W

W (*dŭb'l ū*), the twenty-third letter, is a consonant usually, but sometimes a semivowel. Being made at the lips, it is classed as a voiced or sonant labial, as in *we*, *inward*. *W*'s close relation to *o͞o*, for it begins with this sound, makes it a semivowel, as in *war*, *woe*, *woo*. It is a consonant when beginning a word or syllable, a vowel when ending either. *W*, if not silent, is always followed by a vowel in the same syllable, as above. *W*, after a vowel in the same syllable and before r, is silent as a consonant, as in *glow*, *wring*. *W* first came into use in the 13th century. Before *v* was specialized as a consonantal sign, *w* was called "doubled v," and from this it takes its shape. Its name, however, comes from *u* doubled. Some uneducated Englishmen, especially in London, confuse *v* and *w*, saying *weal* for *veal*, *vine* for *wine*. Even well-educated Englishmen pronounce *when* as *w'en*.

Wabash (*wạ'băsh*), **Ind.,** a city, the seat of Wabash County, on Wabash River, and on the Wabash and the Cleveland, Cincinnati, Chicago and St. Louis Railroad, 40 miles southwest of Fort Wayne. Settled in 1837, it was incorporated the same year, and had its charter as a city in 1865. Among its public institutions are the Memorial Hall, Masonic Temple, White's Institute, besides municipal and school buildings, churches, a public library and a hospital. Besides the railroad shops of the Big Four road, its industries include two cabinet companies, two machine manufactures, a truck-making concern, and factories making paper, paper boxes, hats, wagon parts and rubber tires. The population of Wabash is 9,000.

Wabash, a river of Indiana. It rises in western Ohio, runs through Indiana, forming for 100 miles the boundary line between that state and Illinois, and flows into the Ohio. It is 600 miles long, and is navigable for 300 miles.

Wacht am Rhein, Die (*wăkht ăm rīne, dē*). A modern German folk-song which was adopted as a national song during the Franco-Prussian War of 1870–1. The poem is by Max Schneckenburger (1819–49); the music by Carl Wilhelm (1815–73). The music was composed in 1854 as a part-song for men's voices, and obtained for the composer an annual pension of $150 in 1871. Previous to his attempt the words had received musical treatment from F. Mendel, Leopold Schröter and F. W. Sering, whose work never gained the hold upon the public accorded to Wilhelm's composition.

Wa'co, Tex., county-seat of McLenan County, is about 85 miles from Dallas. It is located in an agricultural region, the chief products of which are cotton and grain. It is quite important as a manufacturing city, and among its products are the saddlery and harness works, wagons and carriages, cotton-products, watches, foundry and machine-shop products, printing establishments etc. Waco has a number of medicinal wells, which attract tourists, the city's water-supply is excellent, and it enjoys all other modern improvements. Waco has excellent public schools, Baylor University (Baptist); Texas Christian University; St. Basil's College (R. C.); and Paul Quinn College (African M. E.). It has the service of six railroads and a population of 26,425.

Wade, Benjamin Franklin, an American statesman, was born at Springfield, Mass., Oct. 27, 1800. He studied law in Ohio, and was three times elected state senator, becoming United States senator in 1851, 1857 and 1863. He was known as a strong antislavery man, being one of six senators who voted to repeal the fugitive-slave law (*q. v.*). He also opposed all the measures proposed as compromises between the north and the south, and was influential in getting the homestead bill through Congress. After the death of President Lincoln, Wade was acting vice-president of the United States. He died at Jefferson, O., March 2, 1878.

Wads'worth, James, a New York pioneer, was born at Durham, Conn., April 20, 1768. He with his brother in 1790 bought a large tract of land in what is now the town of Geneseo, N. Y., and became one of the great landowners of the state. He was very active in promoting the interests of religion and education in the new state, publishing pamphlets, paying for lectures on education, and giving a premium to any town that started a school-library. A library was founded by him at Geneseo, and in all his land-sales he insisted that 125 acres should be set apart for a church and 125 acres for a school. He died on June 8, 1844.

Wagner (*väg'nĕr* or *wag'ner*), **Wilhelm Richard,** a German musical composer, was born at Leipsic, May 22, 1813. He was educated at Dresden and Leipsic, and in 1836 was made conductor of the opera at Magdeburg. *Rienzi* and *The Flying Dutchman* were composed at Paris, where *Rienzi* was unsuccessfully put on the stage, but at Dresden it made him a musical conductor. For his next opera, *Tannhäuser*, he went to the old German songs, but the work was only partially successful when brought out at Dresden. During the Revolution of 1849 in Saxony Wagner was prominent as a leader and had to flee to Zurich, where he lived ten years until allowed to return. *Lohengrin*, composed before he left Dresden, was produced at Weimar under the direction of Liszt in 1850, and in answer to Liszt's call for a new creation he began his collection of operas based on the *Nibelungenlied*. In order to bring out his festival stage play, as he called his Nibelungen collection of operas, he built a theater at Baireuth, Bavaria. Founded on the old German poem, it was a great success both in Bavaria and at London, where Wagner was present at its performance in 1877. His last and perhaps greatest work, *Parsifal*, founded on the story of the Holy Grail, was finished at Palermo in 1882. He died at Venice, Feb. 13, 1883, and was buried at his home at Baireuth. See HOLY GRAIL and NIBELUNGENLIED. Consult *Life* by Nohl.

WILHELM RICHARD WAGNER

Wagram (*vä'gräm*), a village in Austria, ten miles from Vienna, important as the site of the great battle between the Austrians and the French in 1809. Napoleon surprised the Austrians under Archduke Charles by crossing the Danube at night, and was at first driven back; but the next day the French, with a loss of 25,000, forced the retreat of the Austrians, who left 25,000 dead on the field. This battle was followed by the peace of Vienna, Oct. 14, 1809.

Wain'wright, Richard, American naval officer, was born at Washington, D. C., Dec. 17, 1849 (the son of Commander R. Wainwright, who died near New Orleans while commanding Farragut's flagship *Hartford*, Oct. 10, 1862). Young Wainwright entered the Naval Academy and graduated in 1868, when he was attached for a time to the brig *Jamestown* on the Pacific station. Later on he served on the Asiatic station, and after gaining a lieutenancy he did duty on the coast-survey vessel *Arago*. In September, 1894, he reached the rank of lieutenant-commander, and was executive officer on the battleship *Maine* when she was destroyed in Havana harbor (Feb. 15, 1898). After this he did good service at the battle of Santiago de Cuba as commander of the gunboat *Gloucester*, when Cervera's squadron was destroyed. Later he was in command of the ships of the navy at the Annapolis Naval Academy. Retired 1911.

Waite, Morrison Remich, an American statesman, was born at Lyme, Conn., Nov. 29, 1816. He graduated at Yale and began practicing law at Maumee City, O., afterwards settling in Toledo. His reputation as a lawyer led to his being sent to Geneva, in 1871–72, as one of the counsel for the United States in the Alabama case. He presided over the constitutional convention of Ohio in 1873, and in 1874 was appointed chief-justice of the United States. He died at Washington, D. C., March 23, 1888.

Wake, from the Anglo-Saxon word meaning to watch, is a religious festival, once universal in England. The early churches were dedicated to a particular saint, and the festival was kept on the birthday of that saint. The day at the time was reckoned from sunset to sunset, so that the first part of the festival was the night-watch; hence the name. These festivals degenerated into fairs, because of the peddlers etc., who were attracted by the crowd, and became scenes of riot. They were forbidden to be held in the country churchyards by Edward I, and Henry VI abolished all selling at wakes, except of food, while Henry VIII made the first Sunday in October the day of the feast. The wake is still observed in some country parishes in England. The Irish wake is the custom of watching all night around the dead.

Wake'field, Mass., a town in Middlesex County, about 10 miles from Boston. Wakefield is located in the center of a prosperous farming section, but it is also extensively engaged in manufacturing. Its factories make pianos, shoes, knitted underwear, rattan and stoves, and it has brass and iron foundries and machine shops. The town contains three villages, each of which has graded schools. There are one high school and a public library containing 18,000 volumes. Wakefield is on the Boston and Maine Railroad. Population, 12,728.

Wake-Rob'in, the common name of species of trillium and also for the plant known as Jack-in-the-pulpit. There are several varieties of the trillium, which is a species of lily. They grow in damp woods from Canada to Georgia, and are among our best-known wild flowers. There is usually a long stalk with a cluster of three leaves with a single white or purple flower. The curious Jack-in-the-pulpit, which is called wake-robin in the south, has a large greenish or purplish spathe or leaf-like envelop, turning over like a hood, which incloses a long, finger-shaped stem called the spadix. The calla lily belongs to the same family.

WAKE-ROBIN OR TRILLIUM

Waldenses (*wŏl-dĕn'sēz*) or **Vaudois,** a Christian denomination in Italy, founded about 1170 by Peter Waldo, a rich merchant of Lyons, who sold his goods and gave them to the poor, and then went forth preaching voluntary poverty. His followers were called the Poor of Lyons. They did not intend to secede from the church; but, thinking it utterly corrupt, they sought to bring it back to its primitive purity. When the archbishop of Lyons commanded them to be silent, they appealed to Pope Alexander III, but he also forbade their meetings. Waldo, however, continued to preach, and with his followers was excommunicated. His doctrines spread in Italy, France and Bohemia, and especially in the valleys of Piedmont, where the Waldenses were greatly persecuted during the 16th and 17th centuries. In 1680 they suffered at the hands of an Italian and French army, 3,000 being killed, 10,000 imprisoned, and 3,000 of their children being placed in different Catholic towns and villages. They had permission to emigrate the next year, and about 5,000 went from Piedmont to Switzerland, Holland, Brandenburg, Hesse and Württemberg. There are now ten congregations in Württemberg, with over 16,000 members. When all Italy was opened to them in 1858, they chose Florence as their center, removing there their theological seminary and printing press. They formed an Italian evangelical publication society in 1861, and have been especially active in printing religious books. They accept the Bible as their only rule of faith, but hold their *Confession of Faith*, published in 1655, as the most correct interpretation of it.

Waldersee (*väl'dĕr-zā*), Count **Alfred von,** a German general, in command of the allied forces in China during the Boxer rising of 1900, was born at Potsdam, April 8, 1832, and entered the German army in 1850. He served with distinction through the war of 1866, and was chief of the general staff in the Franco-German War; he succeeded Von Moltke as chief of staff in 1888, and in 1891 became commander of the ninth army-corps. In 1895 he was created field-marshal, and in August, 1900, was appointed to the chief command in China of the allied armies engaged in suppressing the Boxer disturbances at Pekin and in the province of Pe-chili. In 1874 he married an American lady, widow of Prince Frederick of Schleswig-Holstein. He died in 1904.

Wales, a part of Great Britain, is a peninsula on the western coast of England, lying between Bristol Channel and the Irish Sea. It is 136 miles long and about 90 wide, with an area of 7,442 square miles, making it about as large as Massachusetts. It has a broken coast-line of 360 miles, and is a mountainous country. The Snowdon Mountains in the north, the Plinlimmon and the Black Mountains are the main ranges, with peaks over 3,000 feet high. There are several small streams, and only one lake, Bala. The country abounds in minerals; copper, lead, iron, coal, zinc and silver are found, and remains of gold mines worked by the Romans. The climate is not severe, though somewhat cold and very damp. Butter, cheese, wool and grain are among the most important products, and iron and flannel are the principal manufactures. All children between the ages of five and fourteen are required to attend schools provided for them, which are practically free. In 1905-6 Wales expended over $1,000,000 on secondary and technical schools. Among the higher institutions are the University of Wales, consisting of the Aberystwith, Bangor and Cardiff Colleges; University College; St. David's College; St. Beuno's College; and colleges at Bala, Brecon, Llangollen and Trevesca. The people are of Celtic origin, and call themselves Cymri, the name Welsh being given them by the English. The English language is spoken in most of the large cities, but Welsh or Cymraeg, as they call it, is the language of the country. It is the best preserved of the Celtic dialects.

Wales was inhabited by three Celtic tribes when the Romans invaded it, but the latter never conquered it. It was in constant warfare with the Saxons and the Danes, paying tribute to Athelstan, king of England, and later to Harold. William the Conqueror subdued it, and the English kings have ever since claimed possession of the country. In 1267 Llewellyn ap Gryffith was acknowledged prince of Wales by Henry III, but, refusing to obey the call of Edward I to Parliament, was attacked and defeated. In 1282 he rebelled again, was slain in battle, his brother David, who succeeded him, was executed as a traitor, and Wales was united to England. The title Prince of Wales has been given ever since to the oldest son of the English sovereign. Under Owen Glendower the Welsh made a final effort for freedom, the struggle lasting 15 years from 1400 till his death in 1415. Population 2,027,610.

Wales, Prince of. In 1301 Edward I, King of England, made his eldest son "Prince of Wales." As he had just conquered that turbulent country and brought it under English law, this act was partly for the sake of compensating the Welsh people for their lost identity. Since that time the heir apparent has been created Prince of Wales, the principality merging in the crown, however, when the heir dies or becomes king.

Wal'fish or **Walvisch Bay,** though a part of Cape Colony, is situated near the center of German Southwest Africa's coast. It has an area of 430 square miles, with a population of 997, of whom 144 are white. It has an excellent harbor frequented by whalefishers, and was made a British possession in 1884.

Walhalla (*văl-hăl'lȧ*) or **Valhalla** (the hall of the slain), in Scandinavian mythology the hall where were gathered the dead who had fallen in battle. The hall, according to the legend, was in Gladsheim (the house of joy), with a grove of golden-leaved trees around it. It was ornamented with shields and spears, and had 540 doors so wide that 800 people could walk abreast through them. Every morning the inmates marched out at the crowing of the cock, and fought furiously until noon, when all wounds were healed, and they sat down to a banquet with Odin, where they were waited on by the Walkyries or battle-maidens. See VALKYRIES.

Walker (*wä'kẽr*), **Amasa.** an American political economist, was born at Woodstock, Conn., May 4, 1799, and died at Brookfield, Mass., Oct. 29, 1875. His early career was spent chiefly in commercial pursuits, but for six years (1842-8) he lectured on political economy at Oberlin College and subsequently (1859-69) at Amherst. In 1848 he was a member of the Massachusetts assembly, and in the following year member of the state senate. In 1862-3 he sat in Congress as member (Republican) for Massachusetts. He was a zealous advocate of temperance, was active in the antislavery movement, and was one of the founders of Free Soil party. He was an authority in finance, and wrote a series of articles on political economy. In 1857 he published a work on the *Nature and Uses of Money*, and in 1866 issued *The Science of Wealth*.

Walker, Francis Amasa, American statistician and political economist, was born at Boston, Mass., July 2, 1840, and died there Jan. 5, 1879. Graduating from Amherst in 1860, he took part in the Civil War and in 1865 rose to the brevet-rank of brigadier-general of volunteers. He was wounded at Chancellorsville, and for a time was an inmate of Libby Prison. In 1871-2 he was United States Indian commissioner; he was also chief of the bureau of statistics at Washington and superintendent of the 9th and 10th United States censuses. From 1873 to 1881 he was professor of political economy in the Sheffield Scientific School at Yale, and in 1881 became president of the Massachusetts Institute of Technology at Boston. In 1898 he acted as United States commissioner to the international monetary conference at Paris, and in the same year was elected to the National Academy of Sciences and made an honorary fellow of the Royal Statistical Society of London. His published writings include *The Indian Question; The Wage-Question, Money; Money, Trade and Industry; Land and Its Rent; Political Economy; Bimetalism;* and a *History of the Second Army-Corps.*

Walker, Robert James, American statesman and financier, was born at Northumberland, Pa., July 19, 1801, and died at Washington, D. C., Nov. 11, 1869. Graduating at the University of Pennsylvania in 1819, he studied law and practiced first at Pittsburg, Pa., and then at Natchez, Miss. Here he came into notice as an opponent of nullification, and from 1836 to 1845 was United States senator from Mississippi. In 1845 he was secretary of the treasury in Polk's cabinet, and prepared and carried what was then known as the Walker tariff (*q. v.*). In 1857 he became governor of Kansas, and in 1863-4 was financial agent of the United States in Europe. Throughout the Civil War he remained loyal to the Union and advocated vigorous measures for the suppression of the rebellion. In later years he practiced law at the capital.

Wallace (*wŏl'lȧce*), **Alfred Russel,** a distinguished English traveler and naturalist, was born at Usk, Monmouthshire, Jan. 8, 1823, and received his education at the grammar-school at Hertford. From an early age he manifested a great love of nature, with marked scientific tastes. This bent was greatly developed in a voyage he made, in company with W. H. W. Bates, a naturalist, to South America, an account of which he has given us in his *Travels on the Amazon and the Rio Negro*, with a fund of material on the physical aspects of these great water-systems, enriched by valuable botanical and ornithological collections. Of this voyage we have further results in his *Palm-Trees of the Amazon and Their Uses* and *Tropical Nature*, dealing with the colors of bird, animal and insect life and with the geographical distribution of plants and animals, sexual selection etc. A prolonged visit to the Malay Islands (1854–62) is the source of his work on *The Malay Archipelago*, published in 1869. This and a volume entitled *Contributions to the Theory of Natural Selection* give him place alongside Darwin as an exponent of evolution — his views on natural selection and variation being, like Darwin's, an explanation of the mode of origin of existing species of animals and plants. A little volume (issued in 1889), explains his theories in regard to evolution and Darwin's work: the volume is entitled *Darwinism*. Two other works from his pen also throw valuable light on the evolutionary theory, *viz.*, *Natural Selection* (1870) and *The Geographical Distribution of Animals* (1876). For these labors, Doctor Wallace received the founder's gold medal of the Royal Geographical Society, the gold medal of the Linnæan Society and the first Darwin medal of the Royal Society. Among his other published works are a volume on *Australasia*, contributed to Stanford's *Compendium of Geography and Travel; The Wonderful Century, Its Successes and Its Failures* (1898); *Island Life* (1880); *Miracles and Modern Spiritualism* (1874); *Bad Times* (1885); and *Land Nationalization* (1882). He died in London, Nov. 7, 1913. See *Autobiography* (1905).

Wallace, Lewis, an American general and writer, was born at Brookville, Ind., in 1827. His military service was in the Mexican War and in the Civil War, where he commanded a division at the capture of Fort Donelson, and guarded Cincinnati when besieged by Gen. Kirby Smith. In July, 1864, though defeated by General Early who was marching on Washington, his attack detained the Confederate forces until Grant had re-enforced the capital. He was governor of New Mexico from 1878 to 1881 and minister to Turkey from 1881 to 1885. His writings include *The Fair God*, a story of the conquest of Mexico; *Life of Benjamin Harrison, The Boyhood of Christ, The Prince of India* and the most popular of his works, *Ben Hur, a Tale of the Christ*. He died on Feb. 15, 1905.

GEN. LEW. WALLACE

Wallace, Sir **William,** the most popular national hero of Scotland, was born about 1270. While studying at Dundee, so tradition relates, he killed a young Englishman in revenge for an insult, and was outlawed. He gathered around him a band of desperate men, whom he led in attacks on the English. His followers and his successes increased until the English king recognized it as an insurrection, and sent an army against the insurgents, when most of the nobles deserted Wallace. He fled to the north, soon collected another army, and drove the English from Scotland, and was chosen guardian of Scotland in 1297. The English renewed the contest, and, the Scottish nobles again deserting, Wallace was defeated at the battle of Falkirk, 1298, and a price put upon his head. He was captured and executed as a traitor, Aug. 22, 1305, though he denied the accusation of treachery, saying he could not be a traitor to the king of England, as he had never been his subject. Consult Jane Porter's *The Scottish Chiefs; Early Days of Wallace* by Bute; *Life* by Carrick; and *Tales of a Grandfather* by Sir Walter Scott.

Wallachia (*wŏl-lā'kĭ-ȧ*). See RUMANIA.

Walla Walla (*wŏl'lȧ wŏl'lȧ*), (meaning Many Waters), **Wash.,** a city on Walla Walla River, capital of the county of the same name, in southeastern Washington, 245 miles east of Portland, 75 miles southwest of Lewiston, Idaho, and 125 miles south of Spokane. It is the seat of a United States military post and of the state penitentiary. Here, also, are located Whitman College and a number of important educational institutions. Walla Walla is a considerable trade-center, especially for the region about (an agricultural, fruit-growing and stock-raising one), including northern Idaho and northeastern Oregon. It is situated on the Union Pacific Railroad. The city has ample waterpower and a number of manufactories, including flour-mills, foundries and machine-shops; lumber, sash, door and blind factories; iron and wire-fence works etc. Population 19,364.

Wallenstein (*wŏl'lĕn-stīn*), **Albrecht Eusebius von,** was born in Bohemia, Sept. 24, 1583. After the death of his parents, who were Protestants, he was sent by an uncle to the Jesuit College at Olmütz, where he joined the Roman church. His studies at Altdorf, Bologna and Padua resulted principally in a faith in astrology and trust in the stars. He served in the Hungarian army and on the side of the emperor in the troubles in Bohemia, securing in the confusion the large estates belonging to his mother's family and confiscated lands, which he formed into a state called Friedland; and in 1623 he was given the rank of prince. In 1626 Wallenstein raised an army of 30,000 men for Emperor Ferdinand, and joined with Tilly, the great

German general, against Christian IV, who was obliged to accept terms of peace in 1629, though Wallenstein had failed in his plan of reaching the sea and destroying the naval power of Scandinavia and of England. He secured for himself the duchy of Mecklenburg. His success, ambition and arrogance made the princes of the kingdom combine against him, and to prevent civil war the emperor in September, 1630, removed him from the head of the army; but with the advance of Gustavus Adolphus he was recalled, and in 1632 with an army of 40,000 men he drove the Saxons from Bohemia and attacked the Swedish army at Nuremberg and Lützen, where, though Wallenstein's forces were defeated Gustavus Adolphus was killed. Wallenstein failed to follow up the advantage this gave the Austrians, as he was secretly negotiating with Saxony, Sweden and France, with the condition that he should be given Bohemia. He had blind confidence in his army and in his destiny, as foretold to him by his astrologers, and did not realize his danger, though knowing that the emperor knew of his plans, until an order was issued at Prague, charging him with treason, and naming his successor. He fled with 1,000 followers to Eger, where he was assassinated on Feb. 25, 1634. Though the deed was not ordered by the emperor, the murderers were rewarded. Schiller made his career the subject of a tragedy, translated by Coleridge as *Wallenstein's Death*. Consult *Life* by Mitchell; *The Thirty Years' War* by Schiller; and *The House of Austria* by Cox.

Walloons (*wŏl-lōōnz′*), the name of the people living in southeastern Belgium, who differ from the rest of the Belgians by language and by their darker color. They are descendants of the *Belgæ*, a tribe of Gauls, who held their ground among the Ardennes Mountains when the rest of Gaul was overrun by German conquerors. Their language is a French dialect, with a large proportion of Gallic words. The name Walloon, that is, foreign, was given them by their Flemish neighbors. They are steadily increasing in numbers, and are likely soon to overbalance the Flemish population of Belgium, as they already take the lead in everything except music and painting. They number about two and one half millions.

Wall Street. A street in New York City extending from Broadway to East River following the line of the early city-wall across Manhattan Island. It at present is the center of financial operations in the United States. The term Wall Street is commonly used to designate the community of financial interests located there, including among others the stock exchange; produce, cotton, coffee and consolidated exchange, the United States subtreasury, assay office and custom house, the New York clearing house, a multitude of national and state banks, trust companies, private banking firms, import and export houses, dealers in commercial paper and promoters, representatives of railroad and industrial corporations and vast private estates; the curb market and hundreds of corporation lawyers and others who have close relations with security markets. There railroad and industrial corporations are organized and financed, stock and bond securities of all kinds find their level of value, money is transferred from one part of the world to another by foreign exchange bills; and fortunes are won and lost in stock speculations. Wall Street is a true barometer of the country's financial condition, reflecting depression and prosperity, if only one make due allowance for speculative flurries.

The stock exchange is the center of Wall Street. It is an unincorporated, voluntary association, with a membership of 1,100. The price of membership fluctuates. Nine thousand dollars was considered a very high price in 1879; but on two occasions (December, 1905, and August, 1906) a seat on the exchange has brought $95,000, the highest price yet paid.

Five hundred firms, besides individual brokers, transact the business of the exchange, buying and selling stock for themselves and for others. All transactions are completed through the stock-exchange's clearing-house, which receives and delivers bonds and stock certificates from 10 A.M. to 2:15 P.M. By this arrangement a broker can close up his day's business just as if it had all been transacted with one man. The arbitrage trade whereby the rate for exchange drafts is determined is carried on here between New York and such cities as London, Paris, Boston and Chicago. The banks do an enormous business in loaning money on sight and for short periods. There are 500 telephones on the floor of the exchange, each in charge of a boy who receives the orders of his office and transmits them to the floor-broker for execution.

Offices on Wall Street connect by private wire with all important cities east of Denver. A private wire from New York to Chicago costs $12,000 annually, but about 25 such wires are leased by the American Telephone and Telegraph Company between Wall Street and Chicago, 50 to Boston and 30 to Philadelphia. It is estimated that 300 representative commission-houses pay expense bills that aggregate $15,000,000 per year. Each concern employs from five to sixty men. The Consolidated Exchange, called "the Little Board," is a body of speculators who deal in small jobs by slyly getting the quotations from the Stock Exchange. They deal in ten-share lots instead of one hundred. It is safe to say, though no official record has been kept, that the volume of business on the New York Stock Exchange has far exceeded that transacted by any other institution in the world.

Wal'nut, species of *Juglans*, and native of the temperate regions of the northern hemisphere. They are fine forest-trees, and also yield most valuable timber. The nuts of various species are well-known. The English walnut is *J. regia*, and is the common walnut of commerce. Its commercial culture in this country is practically confined to California, though it is grown in widely scattered portions of the country. Nut-culture in California has become a very important industry, walnut orchards a feature of the state. They are found along the coast and in the interior valleys. Hardy varieties are grown up into southern Oregon. Nuts are shaken from the trees, spread out in trays to dry, and bleached before shipping. Much damage has been done by a bacterial blight of the nut, in battling with which spraying with Bordeaux mixture is employed. The common black walnut of the United States is *J. nigra*, well known for its fine, dark timber as well as for its characteristic nuts. The tree is distributed generally in this country, but is not very common in the eastern states, being more familiar in rich lands of the Mississippi Basin. It is of slow growth, attains a height of 100 feet, and with its towering and great trunk presents a massive and splendid appearance. The bark is rough and blackish, foliage a light yellowish-green, from 13 to 23 leaflets growing on a stalk. The leaves come late and fall early, and the tree is further deprived of its foliage by the ravaging of countless fall web-worms. The round, black, sharply-furrowed nuts are of excellent flavor. They are encased in a greenish-yellow husk. The wood is heavy, strong and close-grained, and has been so greatly in demand for furniture, interior finish and gunstocks, that the tree is scarcely to be counted longer as a forest tree. The butternut or white walnut is *J. cinerea*, ranging from New England southward to Georgia and westward. It grows from 30 to 50 to 100 feet, has spreading horizontal branches; the bark is grayish, stalks sticky, leaflets oval, sessile. In the scarce foliage there is much of yellow. The wood is light brown, takes a high polish, and is used for furniture and interior finish. The rough, brown, oblong nut, pointed at one end, has a sweet, oily kernel.

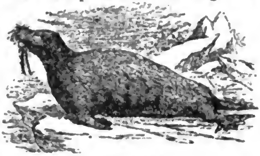
Wal'pole, Horace, Earl of Orford, an English author, was born at London in 1717. He studied at Eton and Cambridge, traveled in Italy, and took his seat in Parliament in 1741, but never was active in public life. His home at Twickenham near London, called Strawberry Hill, adorned with vast collections of pictures, books, manuscripts armor etc., was one of the sights of the time, and admittance was granted by ticket to parties of four from May to October. His writings include *Castle of Otranto*, *Memoirs of the Last Ten Years of the Reign of George II*, *Memoirs of the Reign of George III*, *Catalogue of Royal and Noble Authors*, *Historic Doubts on the Life and Reign of King Richard III*, *Anecdotes of Painting in England* and *Catalogue of Royal and Noble Authors of England*. But his fame rests upon his *Letters*, which are the product of years of acquaintance with public men and events, and entitle him to the rank of one of the best letter-writers in English literature. He died on March 2, 1797. See *Letters*, edited by Cunningham; *George Selwyn and His Contemporaries* by Jesse; and essay on *Letters of Horace Walpole* by Macaulay.

Walpole, Sir **Robert,** Earl of Orford, an English statesman, was born at Houghton in Norfolk, England, Aug. 26, 1676. He studied at Eton and Cambridge. Entering Parliament in 1701, he became secretary of war in 1707 and treasurer of the navy in 1709. He defended the Whig party both with voice and pen, and his political enemies brought against him a charge of corruption, for which he was expelled from the house of commons and imprisoned in the Tower. With the accession of George I he became in succession privy councilor, chancellor of the exchequer and first lord of the treasury. Jealousy among the Whigs and the opposition of the German favorites of the king compelled Walpole's resignation in 1717, but in 1721 he was again called to power, and remained prime minister of England until 1742. His policy was to maintain peace abroad and quiet at home, and during his administration the country was very prosperous. The difficulties between King George II and the Prince of Wales led to his resignation, when he was made Earl of Orford. Charges of bribery were brought against him, but failed to be supported, though he doubless did not scruple to gain his ends by this means. He died in 1745. See Cox's *Life and Administration of Sir Robert Walpole*.

Walpur'gis Night is in Germany the night in which the witches and wizards hold their yearly gathering, the largest being the one held on the Brocken in the Harz Mountains. It originally was a vigil kept the night before May 1, in honor of St. Walpurgis, a sister of some early English missionaries to Germany, who established convents in that country, but it was changed with the belief in witchcraft to its present signification.

Walrus (*wŏl'rŭs*), a marine carnivorous mammal, closely related to seals and sea lions. It is known by its enormous downturned tusks or canine teeth, projecting from the upper jaw, sometimes reaching a length of thirty inches. The tusks are of solid ivory; are useful in defense, an aid in digging and in climbing. Old animals are almost naked, the young ones quite thickly covered with fur of a pale brown color.

Walruses have a thick, clumsy body, deepest at the shoulders, and their feet, which are adapted for swimming, are also furrowed so as to hold on to smooth surfaces. They reach a length of 12 feet or more and a weight of 2,200 pounds. There are two living species, one found in the Atlantic and one in the Pacific. The Atlantic form is still found on the coast of Labrador and Hudson Bay, but formerly extended further south. The Pacific form is more northern, being rarely found on the mainland. They feed largely on clams and other mollusks, which they dig from the sea-bottom with their tusks. They visit islands and ice-floes, and congregate in considerable numbers during the breeding period. They are hunted for their hides, oil and ivory, and their flesh is relished by natives along the Arctic coast. Their decrease is a very serious loss to native Alaskan. The polar bear is the most dreaded natural enemy.



WALRUS

Walsall (*wŏl'sal*), a town in Staffordshire, England, eight miles northwest of Birmingham. Its churches and most of its public buildings are all modern. Harper's almshouses founded by James I, memorial cottages for 12 poor couples or widows and a cottage hospital are among its charities. It has a public library, town-hall, guildhall, theater and schools, including a grammar-school founded in 1554. Its situation in a region of extensive coal-mines and limestone quarries, with iron, stone and brick-clay near, makes it a manufacturing town, with iron and brass foundries. Locks, keys, bolts, pulleys and all kinds of ironware used in making carriages or harness are special manufactures. Walsall was fortified by Ethelfleda, daughter of Alfred the Great, held by William the Conqueror as a royal house, belonged to Richard Neville, Earl of Warwick (the king-maker), and was given by Henry VIII to the duke of Northumberland. Population 96,171.

Walsh, the Most Reverend John, born in Kilkenny, Ireland, 1830, died at Toronto, 1898; studied at St. John's College, Waterford, Ireland. Coming to Canada in 1852, he became a student at the Grand Seminary, Montreal. Ordained a priest in St. Michael's Cathedral, Toronto, in 1854 by Bishop Charbonnel. His first charge was that of Brock Mission, Lake Simcoe, in 1855. In 1857, in charge of the parish of St. Mary's, Toronto. Appointed to the rectorship of St. Michael's cathedral in 1859. In 1862 promoted and became vicar-general of the diocese. Visited Rome in 1864 Appointed Bishop of London (Western Canada), the see being transferred from Sandwich to that city in 1869. His work there was exceptionally successful. The debt of the diocese was paid off, and new churches, convents and an episcopal residence were erected. Visited Rome on two occasions later. On the second occasion, 1887, he assisted at the jubilee of Pope Leo XIII at St. Peter's. In 1889 he was appointed to the archbishopric of Toronto.

Walsingham (*wŏl'sĭng-ăm*), Sir **Francis,** an English statesman, was born at Chiselhurst, Kent, in 1536. He studied at Cambridge. He was distinguished among Queen Elizabeth's ministers for acuteness and for knowledge of public affairs. He was sent on an embassy to France in 1570, to the Netherlands in 1578, to France again in 1581 and to Scotland in 1583. He was secretary of state to Elizabeth, and managed foreign affairs by a system of spies, having it is said, had nearly 60 agents in his service. In this way he got possession of the correspondence of Mary, Queen of Scots, which was used to prove her guilty of conspiring against the life of Queen Elizabeth and he was one of the commissioners at her trial. He died on April 6, 1590.

Waltham, Mass., on Charles River, is a suburb of Boston. It has the Waltham School for Girls, three parochial schools, Notre Dame Training School, and the Waltham Training School for Nurses, besides fine public schools and a library. It is known all over the world for its watches. Besides these, it manufactures watch parts, clocks, watch-making machinery and tools, motor carriages, emery wheels, rivets and buckles, screws, iron and brass foundry products, fine dress goods, cotton cloth, woolen yarns, sweaters, pearl buttons, canoes, church organs, paper, paper bags, and suit cases. It was settled in 1630. Population, 30,000.

Walther von der Vogelweide (*väl'tẽr fŏn dẽr fō'gel-vī'dā*), (Walter of the Bird-Meadow), a German minstrel, or *minnesinger*, was born in Tyrol, between 1160 and 1170. He was attached to the court of Duke Frederick of Austria, at Vienna, for many years, and at his death went from court to court after the fashion of the *minnesinger*. His early poems were love-songs. but the crusades and civil troubles of Germany furnished the subjects of his later verses. He stands in the front rank of the lyrical poets of his country. He died in 1228 or 1230 at Würzburg, where Frederick II had given him a valuable estate. A monument was erected there to his memory in 1843, and a statue of him at Innsbruck in 1877. See MINNESINGER and LITERATURE (GERMAN.)

Walton (*wal'tŭn*), **Izaak,** a famous English author and "The Father of Angling," was born at Stafford, England, Aug. 9, 1593, and died at Winchester, England, Dec. 15, 1683. He was engaged in trade in London, as a linen-draper, between the years 1624 and 1644, and made a competence, upon which he retired and devoted himself to literary pursuits, and to angling, of which he became a renowned exponent. Besides his quaint and fascinating treatise on the rod — *The Complete Angler or the Contemplative Man's Recreation* (1653), he wrote a series of sketches of English divines, embraced in what is known, in their collective character, as Walton's *Lives*. These sketches dealt with Dr. John Donne, Richard Hooker ("the judicious Hooker"), George Herbert the poet and divine, Bishop Robert Sanderson and Sir Henry Wotten, the English diplomatist and author. Walton's *Lives* have deservedly found a place in the best literature and are sure of a long immortality. Considering the stormy era in which he lived, that of the great English Revolution (1642-60), waged by the Parliamentary army against Charles I and on to the Restoration, it is curious to note the serenity of mind and life of Master Izaak Walton.

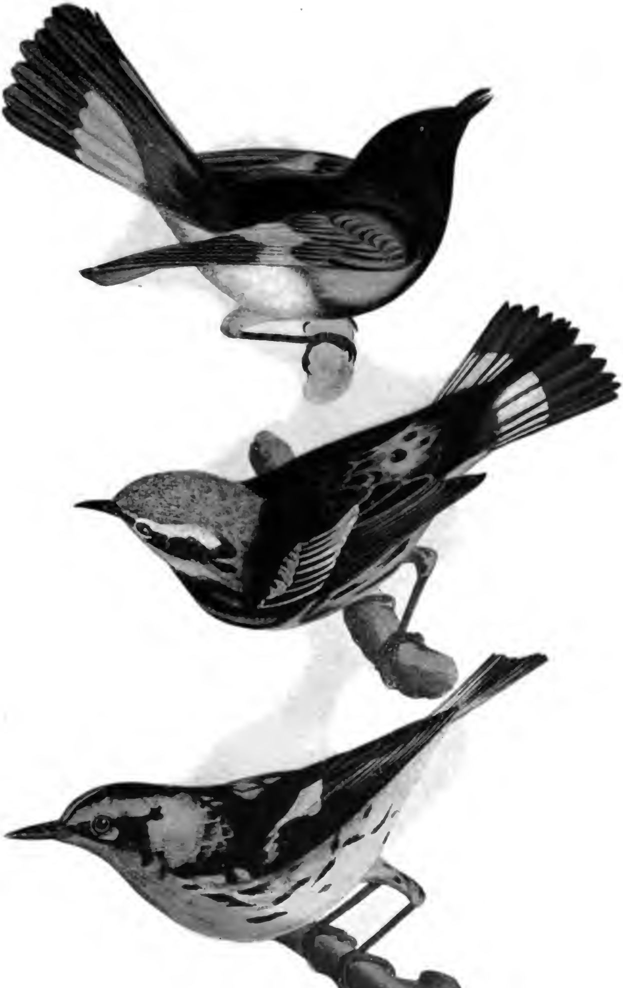
Wampum (*wŏm'pŭm*), the name of Indian money, consisting of strings of shells and shell-beads, which were worn as ornaments. They were used mostly by the Algonquins, and were made on Long Island and around New York. The white wampum, called wampumpeag, was made from the conch-shell and the black or purple wampum or suckanhock from the hard-shell clam. The black was worth twice as much as the white. The beads were made by breaking the shells, rubbing the pieces smooth on a stone, and drilling holes in them so they could be strung. The French, Dutch and New England settlers made use of them, from four to six beads being worth a penny. A string was called a fathom, and was worth from five to ten shillings. A string of wampum was given with every article of a treaty, and a belt of wampum to bind the whole transaction. The belts were embroidered with colored beads, which formed a record of the event.

Wan'amaker, John, an American merchant, postmaster-general of the United States during 1889-93, and man of affairs, was born at Philadelphia, Pa., July 11, 1838, and was educated in the public schools of that city. In 1861, after removing for a time to Indiana, he set up in business for himself in his native city; and in 1876, after turning his establishment into a colossal department-store, with a separate house in New York City, he became the head of the firm — one of the largest concerns in the United States. In the conduct of these establishments he introduced the profit-sharing system among his employés, to their great pecuniary advantage; while his philanthropies manifested themselves in other directions, especially in the founding of Bethany Presbyterian Church and its organizations at Philadelphia and in presiding over the Young Men's Christian Association in that city. He also showed his great organizing and executive ability in the office of postmaster-general of the United States, to which he was appointed in 1889 by President Benjamin Harrison. During the Civil War he was one of the founders of the Christian Commission.

Wan'dering Jew, the name given to the hero of a popular legend. In one story he belonged to the tribe of Naphtali and went with the three wise men from the east to Bethlehem and his stories of the adoration of the infant were the cause of Herod's slaying the children of that region. As a carpenter, he was making the cross for Christ, when He passed on His way to Calvary, and refused Him rest. Christ bade him wander through the earth, without rest, till His second coming, which he has done ever since, seeking death in vain — so runs the legend. In another form of the story, he was a shoemaker at his bench, whereon he refused the Saviour permission to rest. The legend appeared first in the *Chronicle* of Matthew of Paris, and many poems and novels have been based on it, notably *The Wandering Jew* by Eugene Sue. It has also been the subject of illustrations, among the finest being those by Gustave Doré.

Wap'iti, a member of the stag, elk or deer family, often but erroneously called the American Elk. It is now met with only in the far west, among the foot-hills of the Rockies, and across the western boundary of the Canadian Dominion, where it has received its latinized name, *Cervus Canadensis*. It is a large animal, akin to the red deer of Europe, though standing higher, and with broad, spreading antlers, and frequently weighing 1,000 pounds. Formerly it largely furnished the Indians with food, together with ample hides for their lodge-tents, besides buckskin clothing. It is a grazer rather than a browser.

War'bler, the name for any one of a family of small, abundant birds. There are two distinct families, the Old-World and the New-World warblers. The latter are the ones especially referred to here. There are about 100 species, all American. Many of them are less than five inches long, and nearly all are less than six and one half inches. They show great variation in colors and are difficult to identify. About 35 species regularly visit the northeastern



GROUP OF WARBLERS

American Redstart. Magnolia Warbler. Bay-breasted Warbler states, but very few are familiar to the casual observer, for the reason that they perch mostly in the tree-tops, and must be especially looked for. They are all insect-eating and migratory, May and September being the months in which they are most abundant in the eastern United States, some arriving and others passing on their way north or south. The yellow warbler is a summer resident and is abundant in lawns, parks and orchards, but the others mostly inhabit woods. The redstart also is very abundant. It is a pert little bird, with red and black colors and a white belly. The black and white warbler nests in the eastern states. It runs over the bark of trees like a nuthatch. The black-throated, green warbler nests in pine woods from southern New England northward. Besides the tree-inhabiting warblers are a number which live in undergrowth and on the ground. Among these are the oven-bird and the Maryland yellow-throat. The former makes an oven-shaped nest of grass on the ground. It is one of the larger warblers, being about 6.15 inches long. The yellow-breasted chat is the largest of warblers, reaching a length of 7.45 inches. It is one of the few birds which sing regularly at night. The Old-World warblers are not represented in America. The tailor bird (*q. v.*), is an example.

Ward, Ar'temas, an American general, was born at Shrewsbury, Mass., Nov. 27, 1727. He was a graduate of Harvard College. He served in the French and Indian War and was sent as delegate to the provincial congress in 1774. He was commander of the Massachusetts troops at the beginning of the Revolutionary War and was head of the army until the appointment of Washington, when he was made second in command. He was placed first on the list of major-generals by Congress. He was 16 years in the Massachusetts legislature and a member of Congress for four years. He died at Shrewsbury, Mass., Oct. 28, 1800.

Ward, Artemus. See BROWNE, CHARLES FARRAR.

Ward, John Quincy Adams, 1830–1910, an American sculptor, was born at Urbana, Ohio. His first work was done in Washington, and consisted largely of busts of noted men, as Alexander Stephens, Hamlin etc. Since 1861 his home has been in New York. His *Indian Hunter*, *A Private of the Seventh Regiment* and *Shakespeare* are in Central Park, New York City; his colossal statue of Washington is on the steps of the subtreasury building in Wall Street, New York, and a statue of Henry Ward Beecher in Brooklyn, and that of William E. Dodge on Broadway, New York. The *Good Samaritan*, *The Freedman* and statues of *Commodore Perry*, *Washington* and *General Thomas* are others of his well-known works.

Ward, Mary Augusta Arnold (Mrs. Humphry Ward), English novelist, who has achieved a world-wide fame, was born in 1851 at Hobart, Tasmania, where her father, Thomas Arnold, M. A., son of Dr. Thomas Arnold of Rugby and brother of Matthew Arnold, held an educational appointment. "Like George Eliot, Mrs. Humphry Ward's contact with literature and life has been broad and fruitful." Her ability and scholarship were shown early in her literary career by her contributions to *Macmillan's Magazine*, by her articles in Smith's *Dictionary of Christian Biography* and by her translation of Amiel's *Journal Intime*. Her first venture in fiction was a tale of an actress's life — *Miss Bretherton* (1884). Four years later appeared *Robert Elsmere*, a remarkable though rather skeptical production, dealing with the struggle of an aspiring soul toward a newer theistic faith and creed. In 1892 came from her gifted pen *The History of David Grieve*, and two years subsequently appeared *Marcella*, the latter a noble study of woman's nature. Among other writings are *Sir George Tressady*, a sort of art sequel to *Marcella* and *Helbeck of Bannisdale*, two works of remarkable power and compelling interest. Mrs. Ward is intimately associated with the social and educational work of University Hall, an institution in London, now merged in Passmore Edwards' Settlement.

MRS. HUMPHRY WARD

Ware, Mass., a city in Hampshire County, on Ware River and the Boston and Albany and Boston and Maine, 22 miles west of Worcester and 25 northeast of Springfield. It occupies high ground, and manufactures cotton and woolen goods, boots and shoes. It has an opera house, public library and numerous churches and good schools. Ware was incorporated in 1761. The population is 9,327.

Waring (*wâ'rĭng*), **George Edwin,** American sanitary engineer, was born at Poundridge N. Y., July 4, 1833, and died in New York City, Oct. 30, 1898. He was educated at Poughkeepsie, studied agriculture, and lectured on it in Maine and Vermont. From 1857 to 1861 he was drainage engineer of Central Park, New York; and on the outbreak of the Civil War he became major of the Garibaldi Guard, after which he raised and became major of the Fremont Hussars, and subsequently colonel of the 4th Missouri cavalry. In 1880 he became special agent of the United States 10th census and, later, member of the national board of health. His knowledge of drainage problems made him very useful to the authorities of New York City and led to his being consulted by those of other towns and cities. After the yellow fever epidemic of 1878 in Memphis he devised the sewage system of that city, and from 1895 to 1898 he was commissioner of street cleaning in New York, doing wonders as administrative head of the department. In October, 1898, he was appointed head of a commission to improve the sanitary condition of Havana and other Cuban towns and to select the sites of camps for the American troops. His published works embrace *Draining for Profit and Draining for Health*, *How to Drain a House*, *Sewerage and Land Drainage* and *Sanitary Drainage of Houses and Farms*.

Warm'ing and Ven'tila'tion are so connected as to be best treated in one article. In one sense they are opposed to each other, as the necessity of ventilation or pure air requires frequent changes of the air, which thus carry off the heated air of a room and require more heat to replace it. The human body must be kept at a temperature of 98° for healthy living, which is secured partly by food, which supplies heat, and by clothing to retain the heat, but largely by artificial heat in houses. Pure air to breathe is also a necessity. The air we breathe contains oxygen and a small part of carbonic acid, which in large quantities is a poison. In breathing, the oxygen is taken from the air and carbonic acid is added to it, so that without a fresh supply the air of a room becomes in a short time so full of carbonic acid as to be poisonous. In warming and lighting a room the same process goes on — the oxygen is taken from the air and carbonic acid gas is given out. A person uses up the oxygen in four cubic feet of air every hour, and makes impure with carbonic acid one cubic foot of air every minute. A large oil-lamp will make impure 70 cubic feet of air an hour; a pound of coal in burning will use up 120 cubic feet of air; and a cubic foot of gas will rob ten feet of air of oxygen. Besides heating the fresh air let into a room for ventilation, the warming apparatus has to overcome the loss of heat through glass windows, walls, floors and ceilings.

The methods of warming and ventilating a room are numerous. The open fire, stoves and furnaces, supplying hot air, hot water or steam, are all in use and all have their advocates. The open fire gives the best ventilation, but is wasteful of coal and unequal in its heat. The close stove is economical of fuel and heats a room quickly, but burns the air, making it too dry for health. The use of furnaces has become quite general, especially for large buildings, as they heat every part of the house and at much less expense than would be necessary to heat the same space with stoves or grates. They burn the air, however, rendering it too dry, and need careful management. In order to prevent the escape of heat double walls, double windows and well-fitting doors are used, but the more successful these contrivances are, the less fresh air enters and the more need of artificial ventilation. If houses were perfectly built, the inmates would suffocate. Two things are necessary in ventilation: to remove foul air and to bring in pure air. As hot air rises, an open chimney in which the air is heated and drawn up, the cold air from the cracks and crevices taking its place, is always a ventilator, and in ordinary rooms, as houses are usually built, a sufficient one. Other methods in use are ventilating shafts, with openings at top or bottom or both, for the removal of the impure air and the introduction of fresh air; the heating of currents of fresh air introduced into stoves or furnaces and then distributed; and in large buildings pumping engines to force fresh air through pipes into all the rooms. The whole subject of warming and ventilation, however, is still a problem to builders. SEE HEATING.

War'ner, Charles Dudley, an American writer, was born at Plainfield, Mass., Sept. 12, 1829. He was a graduate of Hamilton College, practiced surveying in Missouri, studied law in the University of Pennsylvania, and practiced in Chicago until 1860. He was editor of the *Press* and *Courant* at Hartford, Conn., and of a department in *Harper's Magazine*. Among his many writings are *My Winter on the Nile*, *A Round-about Journey*, *Their Pilgrimage*, *My Summer in a Garden*, *Baddeck and that Sort of Thing* and *Backlog Studies*. He also edited the series of *American Men of Letters* and *Library of Literature*. He died on Oct. 19, 1900.

CHARLES DUDLEY WARNER

Warner, Susan, an American author, was born at New York City in 1819. Her stories for girls have been very popular, especially the *Wide, Wide World*, which has had the largest circulation of any American novel except *Uncle Tom's Cabin*. Other writings are *Queechy*, *The Hills of the Shatemuc*, *The Old Helmet*, *Ellen Montgomery's Book-Shelf* etc. She was best known by her pen-name, of Elizabeth Wetherell; she died at Highland Falls, N. Y., March 17, 1885.

War'ren, O., county-seat of Trumbull County, on Mahoning River and the Pennsylvania, Erie and Baltimore and Ohio railroads, 52 miles southeast of Cleveland. Settled at the beginning of the 19th century, it was incorporated a generation later. It is situated in a good farming-region, through which electric tramways connect its chief towns. Its buildings include a public library, an hospital, opera-house, churches, schools and municipal offices. Its industries embrace a rolling-mill, tube-works, electrical apparatus and supply establishments, besides manufactories of automobiles, bath-tubs, stoves, ranges, tank-cars, shovels and fire-extinguishers. Population 11,081.

Warren, Pa., a borough, county-seat of Warren County, on the Alleghany River and on the Dunkirk, Alleghany Valley, Pennsylvania and Western New York railroads, 60 miles southeast of Erie. Besides a theater and a public library it has the state asylum for the insane. Settled about 1795, it was incorporated in 1832. Its industries embrace iron and steel works, machinery-works, oil-refineries, lumber-mills, furniture-factories and establishments for the manufacture of glue, barrels, wood-alcohol and pianos. Population 11,080.

Warren, Gouverneur Kemble, American soldier, was born at Cold Spring, N. Y., on Jan. 8, 1830. Studying for the army at West Point, he graduated in 1850, after which he acted as chief topographical engineer in the Sioux expedition of 1855. Returning to West Point, he for two years was assistant-professor of mathematics, but in 1861 accepted the lieutenant-colonelcy of the Fifth New York Volunteers, and took part in the battle of Big Bethel and was promoted to be brigadier-general for gallantry at Gaines' Mill. He subsequently distinguished himself at Malvern Hill, Manassas and Fredericksburg. In 1863 he acted as chief of topographical engineers under Hooker, and later as chief engineer in the Army of the Potomac. He also was at Gettysburg, and for his distinguished services there and in the field gained a brevet-colonelcy in the regular army and a step in rank, that of major-general of volunteers. Still later he took part in the battles of the Wilderness, and served professionally at the siege of Petersburg and in the Richmond campaign. In the battle of Five Forks he had some disagreement with General Sheridan, who relieved him of his command, though the result of a court of inquiry into the matter between them relieved Warren of personal blame. Reinstated, he was given command at Petersburg and was later in charge of the Department of the Mississippi. In 1865 he resigned his commission in the volunteers and was brevetted major-general in the regular army, and subsequently rendered approved service on surveys and in the improvement of harbors. He died at Newport, R. I., on Aug. 8, 1882.

Warren, Joseph, an American patriot, was born at Roxbury, Mass., June 11, 1741. He graduated at Harvard College, and began the practice of medicine at Boston. He twice delivered an address on anniversaries of the Boston Massacre. In 1774 he was president of the Massachusetts Congress, and was by it made a major-general. At the battle of Bunker Hill he appeared unattended, and, declining to take the command which was offered him, fought as a volunteer. As he was leaving the field, being one of the last to retire, his name was called by a British officer, who, commanding his men to stop firing, urged Warren to surrender. But as he turned his head at the sound of a voice, he was instantly killed by a ball striking him in the forehead, June 17, 1775. His statue at Bunker Hill was unveiled on June 17, 1857. See *Life* by Frothingham and that by Everett in Sparks' *American Biography*.

Warren, Samuel, an English novelist, was born in Wales in 1807, and died at London, July 29, 1877. He was a lawyer and edited an edition of Blackstone's *Commentaries;* but is best known by his novels, which appeared in *Blackwood's Magazine*, entitled *Ten Thousand a Year* and *Passages from the Diary of a Late Physician*. His other works are *Now and Then* and *The City and the Bee*.

Wark, Hon. David. Born near Londonderry, Ireland, in 1804. Came to New Brunswick, Canada, in 1825. Became a merchant. Elected to the New Brunswick Legislature in 1843. Appointed to the Legislative Council in 1851. Sat in the Council until the Union 1867. Appointed to the Senate at Federation. He wrote political pamphlets and was an active senator until within a few years of his decease. Called the Nestor of the Canadian Parliament. Died 1906.

War'saw, the former capital of Poland and the third city of the Russian Empire, is on the Vistula River, about 395 miles east of Berlin. It stands partly on a plain and partly on rising ground, and is connected with one of its beautiful suburbs by two fine bridges. There are about 160 palaces in Warsaw and 180 churches, among them the Cathedral of St. John, which dates from 1250; several theaters, one of them in a garden laid out in the old bed of the Vistula; fine squares and public gardens, with monuments to Sobieski, Copernicus etc. The university, founded in 1816 and closed by the Russians in 1832, was opened again in 1864. It has a library of 350,000 volumes, a fine observatory and 1,114 students. The leading industries of the place are plated silverware, musical instruments, carpets, boots and shoes, carriages, woolen cloth and beer. Warsaw is first mentioned in history in 1224. It belonged to the dukes of Mazovia until 1526, when the land of the Mazurs was annexed to Poland. It was fought over continually by the Swedes, Russians, Brandenburgers and Austrians. In 1795 it was given to Prussia; in 1806 Napoleon's troops occupied it; in 1809 the Austrians; and the Russians finally obtained possession in 1813. Two unsuccessful rebellions against Russia occurred, one in 1834 and the last in 1863. The Russian government, determined to crush out utterly the spirit of independence, took severe measures, executing or banishing to Siberia the nobles and clergy and confiscating their property, carrying off in large bodies the tradesmen, closing the university, schools, monasteries and convents, and placing Russian officials in all places of power. The use of the Russian language was commanded, and even the name Poland was cut out of all legal documents. Population 764,054.

Wartburg (*värt'bōōrg*), an old German castle, near Eisenach, in Saxe-Weimar. The Wartburg War is the name given to a contest of the principal *minnesinger* of Germany, which was held at the castle about 1206. The castle also is the scene of the legend of St. Elizabeth of Hungary, who was the wife of one of the landgraves of Thuringia, to whom it belongs. It is best known, however, as the place where Luther was hid after the Diet of Worms and where he translated the Bible into German. In 1817 the German students celebrated here the three hundredth anniversary of the Reformation. The castle was built in 1070.

War'wick, Richard Neville, Earl of, called the king-maker, was born about 1420. He was a son of the earl of Salisbury, but through his wife obtained the estates and title of Earl of Warwick. In the Wars of the Roses he sided with the duke of York and won for him the battle of St. Albans, receiving in recompense the governorship of Calais and command of the English fleet for five years. At the battle of Towton, near York, the followers of Lancaster were gaining ground, when Warwick, riding up to Edward, duke of York, and getting down from his horse, which he shot in the head as a signal for an attack without retreat, said: "Sire, let him flee who will, but by this cross I will stand by him who will stand by me." The Yorkist party won, and Edward was crowned king in London, June 22, 1461. Edward's marriage with Elizabeth Woodville and that of his brother Clarence to Warwick's daughter made a breach between the two, which ended in the battle of Edgecote, where Edward was made a prisoner. After a partial reconciliation and another insurrection, Warwick openly deserted to the Lancastrian party under Queen Margaret, his son-in-law Clarence being promised the succession to the throne. Edward IV fled to Holland, and the imprisoned monarch Henry VI was restored, but only for a few months. Edward returned, with an army of 2,000 Englishmen; Clarence deserted Warwick and came to hs aid; Henry was again sent to the Tower; and at the battle of Barnet Warwick's forces were defeated and Warwick was slain (April 14, 1471). He lived royally, owning 100 manors, the city of Worcester and the Islands of Guernsey, Jersey, Alderney and Sark. At his house in London six oxen were usually eaten at a breakfast, and he daily fed 30,000 guests. He is called The Last of the Barons. See *Baronage of England* by Dugdale and *History of England* by Lingard.

Warwick, R. I., town in Kent County, on the Pawtucket and Providence Rivers and Cowsett and Narragansett Bays, five miles from Providence. The town is made up of several villages, each containing graded schools, and some have libraries. The chief manufactories are cotton mills, flour and grist mills, blacksmith and wheelwright shops, foundry and machine shops. Warwick was established in 1642 by a colony of Englishmen, and bore the name of Shawomet. In 1848 admirers of the Earl of Warwick changed the name. It has the distinction of being the birthplace of Nathanael Greene (*q.v.*). It is served by the New York, New Haven and Hartford Railroad. Population 26,629.

Wash'burne, Elihu Benjamin, an American statesman, was born at Livermore, Me., in 1816. He studied law and began his practice at Galena, Ill., in 1840. He was in Congress from 1852 to 1869, and was called the Father of the House for his long service. He was minister to France during the Franco-Prussian War, and at the request of Germany very skillfully protected Germans who were residing in France at the time. He wrote *Recollections of a Minister to France*. He belonged to a family of statesmen, two of his brothers being in Congress with him, and the governors of Wisconsin and Maine, and another brother was United States minister at Paraguay. Elihu Washburne died at Chicago, where he spent the last years of his life, Oct. 22, 1887.

Wash'ington, the extreme northwestern state of the Union, abutting on the Pacific. The Columbia River, in the main, marks its southern boundary and separates it from Oregon. Its boundary on the west is the Pacific, on the east Idaho and on the north British Columbia, the Strait of Juan de Fuca separating it from Vancouver Island, a part of British Columbia. The Cascade Mountains traverse the state from north to south and extend southward into Oregon. The area of the state is 69,180 square miles, its length being 230 miles and its extreme breadth 340. The present population is 1,565,810. Its capital is Olympia. The larger cities are Seattle (population 237,194), Tacoma (83,743), Spokane (104,402) and Walla Walla (19,364).

Surface and Climate. The Cascade Mountains' lofty peaks are striking features. They embrace Mount Baker (10,827 feet), Glacier Peak (10,436) and, farther south, Mt. Rainier or Tacoma (14,363), Mt. Adams (12,470) and Mt. St. Helens (10,000). In the northeast, between Puget Sound and the Pacific, is the coastal range known as the Olympic Mountains, the highest peak of which is Mt. Olympus. In the southeast are the Blue Mountains, while in the northeast there are several ranges of the Rockies. Bordering on the Chelan range is oblong-shaped Chelan Lake; west of the range and extending southward from the Strait of Juan de Fuca is the extensive basin of Puget Sound, with its variedly ramifying arms. Besides the Columbia the chief rivers are the Snake, its most important tributary, entering it from the east, the Okanagan, the Yakima, the Pend' Oreille, the Spokane, the Chehalis, Skagit, Nesqually and other streams. The coastal inlets, besides that of the Columbia River and Puget Sound, are Gray's and Wallapi Harbors. The climate varies greatly, the region west of the Cascade Range being much more humid and, on the whole, warmer and more equable under the tempering influence of the ocean; while in the east the rainfall is barely normal and less favorable for agriculture, and the soil for the most part is infertile, with underlying rock and lava-covered surface. The east, moreover, is treeless in parts, though there is much yellow and white pine, while the west has magnificent forests, in whi h occur gigantic conifers, cedar, spruce and hemlock.

Natural Resources. The lumber industry leads all others in the annual value of its products. The number of establishments turning out timber and planing-mill products annually is close upon 1,265, with an output valued at over 89 million dollars, while the number of wage-earners engaged in the trade exceeds 43,000. To conserve and promote the industry, the Federal government has established five forest reserves aggregating over seven million acres. Agriculture also does well, despite the large mountainous areas. Of the yield from the cereals wheat has by far the best showing, the annual yield being 25,603,000 bushels, while the product of oats is 8,817,000 bushels. The barley and the hay crop are also large, while fruit-culture, especially apples, plums and prunes, is a profitable and growing industry. Stock-raising is an important industry. Statistics show the state has 475,555 sheep, 215,887 cattle, besides 186,233 dairy-cows, 280,572 horses and 206,135 swine. The fisheries also are an important industry, the total amount invested in the trade being over seven and a half millions. The annual catch of salmon is especially large, and the fish-canning industry is very important. Coal yields largely, the annual output, including lignite as well as bituminous coking-coal, being 3,602,263 short tons. Of quarried building-stone, embracing granite and limestone, as well as the clay products of brick and tile, the state has about $3,000,000 in value. Gold, silver, copper, iron and lead also are among its products.

Manufactures. With the advantages the state has in coal, extensive water-power and good facilities of transportation, Washington's growth in manufacturing industries is to be looked for. Already it has over 222 million dollars invested in manufactures, while the value of the products of all kinds is at present close upon 220 millions. The number of wage-earners is 69,120, wages amounting to nearly 50 million dollars. Among the chief manufactures are those of the timber and lumber mills, of flour and grist mills and of fishing, curing and canning establishments. Fish-canning nets annually close upon five million dollars, while the flour and grist mill receipts per year are nearly seven million. Besides, there are the factory product in cheese, butter and condensed milk and the product of the slaughter-houses and meat-packing establishments.

Commerce and Transportation. With such facilities in the furthering of oceanic trade from the Puget-Sound ports of Seattle and Port Townsend, as well as from those in the Columbia River, commerce is bound steadily and largely to increase. Already Washington has a large oriental and Pacific trade from Seattle and Port Townsend. The railway mileage is now over 3,000 miles, the chief lines being the Northern Pacific and the Great Northern, while it is connected at Seattle with the Canadian Pacific. There are eight other railroads in the state, including the Chicago, Milwaukee & St. Paul, North Coast and Union Pacific line. Large steamers reach Vancouver on the Columbia, while there is a large inland navigation, of smaller steamers, on that river, as also on Snake River. The assessed valuation of the state is at the present time nearly 310 millions.

Education. The public schools are under a board of education, with a state superintendent of public instruction. The school-population is in excess of 276,000, the enrollment being 220,461 and the daily average attendance about 163,000. The teachers number about 7,600, four fifths of whom are women; and the total expenditure for school maintenance amounts to over four and one third million dollars.

Agricultural colleges are maintained by the state at Pullman and Seattle, and at the latter is the University of Washington, with 106 instructors and 2,358 students. The other higher seats of learning are Whitman College (undenominational) at Walla Walla, with 40 instructors and 494 students; Whitworth College (Presbyterian), Tacoma, with 19 instructors and 144 students; the University of Puget Sound (M. E.) at Tacoma; and Gonzaga (R. C.) College at Spokane. State normal schools are in operation at Cheney and Ellensbury; at Chehalis there is a reform school; at Vancouver a school for defective youth; at Orting a soldier's home; and at Walla Walla a state penitentiary.

History and Government. The early history of the region is marked first by conflicts between Spain and Great Britain and later by difficulties between England and the United States. These disputes occurred as the result of early exploration and the successive operations of the fur-traders. As far back as the 16th century the Oregon region was visited by Sir Francis Drake, while a Greek mariner in the Spanish service is credited with having discovered and named the Strait of Juan de Fuca. Captain Gray of Boston discovered and entered Columbia River in 1792. George Vancouver, the English navigator who gave his name to Vancouver Island and Vancouver City, was another explorer of the region about 1791–2. He was preceded by Captain Cook, who in 1778 discovered Nootka Sound, the deep inlet in Vancouver Island; while at the close of the 18th century Captain Vancouver penetrated Puget Sound and disclosed its ramification of bays and harbors. Later came the fur-traders, and among them Jacob Astor, who in 1811 founded Astoria on the southern bank of the Columbia near its outlet. This post was captured in the War of 1812 by the British and renamed Fort George, though five years later it was restored and supplanted by Fort Vancouver, founded in 1824–5. In 1804–6 the Lewis and Clark expedition explored the region, and upon this expedition and its explorations, together with the purchase from France of the Louisiana Territory as well as upon Gray's discovery, rests the American claim to the region, including the great waterway of the Columbia. Settlement at first progressed slowly, immigration not coming until the thirties, when Walla Walla was founded, followed ten years later by settlement about Puget Sound. About this period Oregon organized a territorial government which included Washington and part of Idaho; but in 1853 Washington was formed into a territory with a government of its own; this continued till 1889, when the territory was admitted as a state. Before 1840 boundary differences became acute on several occasions, increased by the clamor of gold-seekers who sought to know to which nation — Britain or the United States — they owed allegiance. The matter was a vexatious one, as both countries from 1827–8 had jointly occupied the region, the British seeking ownership as far south as the mouth of the Columbia and Russia agreeing not to encroach southward below 54° 40′. About 1844 the difficulty almost precipitated war between England and the United States, for the Democratic rallying-cry of the era was "Fifty-four forty, or fight!" In 1846 the boundary agreed upon by the Webster-Ashburton treaty was 49° N., the separating line being the channel between Washington and Vancouver Island. This settlement, as it turned out, was vague, for in 1859 the question arose as to whether the channel gave the United States possession of Haro Archipelago and San Juan Island. The contention being submitted for arbitration to Germany, its emperor in 1872 decided in favor of the United States. In 1885–6 there was trouble with the Chinese entering the state, the governor being obliged to call Federal troops to his aid in quelling disturbances at Seattle. Thirty years prior to that the state had to contend against the Indians who troubled both Washington Territory and Oregon. Consult Hawthorne's *Washington;* Irving's *Astoria;* Squires' *Resources and Development of Washington;* and Bancroft's *Washington, Idaho and Montana.*

Washington, D. C., the capital of the United States, is in the District of Columbia on the Potomac River, 39 miles southwest of Baltimore. The city was laid out under the direction of Washington, on a plain 40 feet above the river, with wide streets and 21 broad avenues, named after the states. Three streets, known as North, South and East Capitol Streets, radiate from the Capitol, and with a line of public parks divide the city into four quarters. The avenues run diagonally, and where they cross circles are formed, with triangles at their intersection with the streets, and besides these ornamental spaces there are a number of squares with trees, shrubbery, fountains and statues. Pennsylvania Avenue is the main street of the city, and Massachusetts Avenue the finest.

The chief public building is the Capitol, of which the corner-stone was laid by Washington in 1793, and the structure finished in 1827. An extension of two wings was finished in 1867. The building covers about 3½ acres, and is 751 feet long and 348 feet broad. The dome, 287½ feet high, is crowned by a bronze statue of Liberty. The rotunda under the dome, senate chamber, hall for the house of representatives and one for the supreme court are some of the interior rooms. The White House, the residence of the president of the United States, is a mile and a half from the Capitol. It was first used by President Adams in 1800. The other public buildings are the treasury, state, war, navy, interior and post-office departments, pension building, Smithsonian Institute, observatory, arsenal and the new Congressional Library building, in modified Italian-renaissance style, which has a capacity for 4,500,000 volumes and is one of the finest of all the capital buildings. The National Deaf-Mute College, the only one in the world, Howard University, Columbian University and the Catholic University are among the educational institutions. The government hospital for the insane, naval hospital, soldiers' home and Columbian Institution for the deaf and dumb are a part of its charities. The Corcoran Art Gallery contains one of the finest collections in America. The Washington monument, 555 feet above the foundations, the highest in the world; the Lafayette monument, naval monument, Abraham Lincoln with the proclamation of emancipation, a statue of Jackson, made from the cannon captured at New Orleans, and one of Scott, from cannon taken in the Mexican War; and statues of Washington, Garfield, Greene, Marshall, Dupont, Farragut, Franklin, Luther and Marquette are some of the best known of the monuments of the city. The site of Washington was selected by General Washington in 1791, and Congress met there for the first time on Nov. 17, 1800. In 1814 it was occupied by the British and the public buildings burned. Though several times threatened during the Civil War, it was never attacked. Since 1871 the city has been improved at great expense, making it now one of the most beautiful cities in the world. Population, 353,378. See DISTRICT OF COLUMBIA and articles under titles as above.

THE CAPITOL

Washington, Ind., a city, the seat of Daviess County, on the Baltimore and Ohio Southwestern and Evansville and Terre Haute Railroads, 20 miles east of Vincennes and 86 southwest of Indianapolis. It has a fine farming and stock-raising country tributary to it, and produces large quantities of bituminous and cannel coal. It is a shipping-point for grain, cattle, flour, coal, fire-clay, brick and tiling etc. It has a public library, several banks, daily and weekly newspapers, besides schools and churches Population 9,045.

Washington, Pa., a city 30 miles southwest of Pittsburg, is in the center of valuable fields of gas, coal and oil. It has carriage and glass factories, and also makes brick. This city is the seat of Washington and Jefferson College, Trinity Hall Academy and Washington Ladies Seminary. The college was formed in 1865 by the union of Washington College, which as an academy dated back to 1787, and Jefferson College, which grew out of Canonsburg Academy, opened in 1791. Population, 18,778.

Washington, Book'er Taliaferro, principal of Tuskegee Normal and Industrial Institute, Tuskegee, Ala., was born in Franklin County, Va., about 1859. Born a slave, he grew to great prominence as a speaker and writer on racial and on educational topics. Early in life he worked in salt-mines in Malden, W. Va., but managed to make his way to Hampton Institute, Virginia, where he received an education. In 1881 he was called to Tuskegee Institute, founded by him in the interests of the colored race, which he sought to elevate by means not only of religious instruction but by an academic training, coupled with courses in manual and industrial work of a useful and practical character. Over 1,000 students annually attend the institute and find their way afterwards into industrial occupations. The institution is nondenominational and is for both sexes, the founder's idea being to enable his colored brethern to meet present-day conditions, social and industrial, in the South. He has accomplished his aim by giving the students graduated from Tuskegee Institute a suitable education and good moral training, and the work will be continued along the lines laid down by him. He died Nov. 14, 1915.

Washington, George, is the other American hero whose fame is not wholly accounted for by the record of his life. Like Lincoln the man was infinitely greater than anything he did. A military genius, he wrested liberty from tyranny; a statesman, he helped evolve a stable government from political chaos; a patriot, he refused a crown. Wisdom, patience, tolerance, courage, consecration to the righteous cause animated his every act; ingratitude, injustice and treachery never embittered him, but served to strengthen his character. He grew in dignity and in capacity to the need of his growing responsibility and power, but he never became arrogant; and ambition and opportunity never tempted him from the narrow path of honor. Yet, after we have reminded ourselves of all his lofty virtues and his incomparable services, we have still not expressed the feeling we have for his memory. We are continually admonished to shape our lives and our conduct by the model he has established for us; and to think less of the reward, more of the duty well-done.

GEORGE WASHINGTON

The first president of the United States was of the fourth generation of the Washington family in America. His great-grandfather, John Washington, came over from Yorkshire, England, in 1657. That he was a man of education, property and good birth is proven by the fact that he took up a large tract of land in Westmoreland County, on the Potomac, laid out a tobacco-plantation, acquired slaves, became a magistrate and a member of the Virginia House of Burgesses. This property was still in the family when George Washington was born, February 22, 1732, three quarters of a century later. He was the oldest of the five children of Augustine and Mary Ball Washington. He had, however, two older half-brothers. The oldest, Augustine, seems to have taken over the estate on the Potomac, and Lawrence to have acquired the Mt. Vernon property through his marriage with a Miss Fairfax. With his second wife and younger children the father removed to a plantation on the Rappahannock, near Fredericksburg. It was here that Washington grew up, under the care of his mother, for his father died when he was under 11. He learned to read, write and cipher in a school kept by the sexton of the parish church, and, later, had private tutoring in geometry and surveying. It was to his wise, lovely, devoted mother that he owed his moral and religious training. Her favorite book was Sir Matthew Hale's *Contemplations*. It was filled with precepts and maxims, easily memorized and easily applied to daily conduct. From these Washington early compiled his maxims. When he died, his mother's book was found carefully preserved in the library at Mount Vernon.

As was the unjust custom of that time, very little provision was made for the younger children. Washington, Jefferson and Franklin. in forming our government, saw that this law of entail by which the oldest son inherited the estate, was broken. Washington's older half-brother Lawrence, who was rich and influential, did everything he could to further his promising brother's fortunes. A warrant as midshipman in the king's navy was secured for him, but his mother refused her consent for him to go to sea. He then fitted himself for an appointment as surveyor of Lord Fairfax's enormous grant of Virginian land. At 16 he began this work, making his home ever after at Mount Vernon. The traits of character he had displayed in school and among his playmates now came out prominently. In the schoolboys' soldier-plays he had always been chosen captain because of natural ability to direct others. In games of skill he was the umpire for his fairness. He excelled in running, wrestling and horseback-riding. His school-papers were models of neatness and accuracy. Now he had to live afoot and on horseback in the wilderness; he had helpers to direct, inferiors to govern; and he had to make out survey-records so complete and accurate that they would be accepted by public officials upon which to base titles to land. When he returned from three years of hardships and danger and exacting work in mountain and forest, he was a handsome youth of 19. He had his full height of six feet two inches. Slender at that time, he added weight with the years. In his later life his appearance was one of the greatest dignity and nobility. He had blue eyes, an abundance of brown hair and a clear, ruddy complexion. His manner was self-controlled, his speech well-considered. Even as a stripling he was considered a man of such remarkable gifts and experience that at 21 he was made major of the Virginian militia at a time when the colonies were preparing for war with France, and was entrusted with a message to a French post, 600 miles distant, by Governor Dinwiddie.

That journey was a severe test of character and capacity. It took him across unexplored mountains, through trackless forests infested with wild beasts and hostile savages. A treacherous Indian guide attempted to assassinate him. He narrowly escaped drowning when crossing the flooded Alleghany on a rude raft. He was looked upon as the rising hope of the colony, and in the French and Indian War he was made an aid-de-camp to General Braddock. His advice as to methods employed by the Indians in border warfare was ignored, and Braddock suffered a terrible defeat. Washington was the only mounted officer in the engagement who was not killed. Two horses were shot from under him and he had four bullet holes in his coat, but he escaped unhurt. He wrote to his mother that he felt he had been preserved by Providence for some great duty. The Indians believed he bore a charmed life. In 1758 he carried the British colors into the smoking ruins of Ft. Duquesne, and helped rebuild it as Ft. Pitt (now Pittsburgh). When, at the end of the war, the speaker of the Virginian House of Burgesses formally thanked him for his military services he was too confused to speak. "Sit down, Col. Washington," said the speaker; "your modesty equals your valor and that is beyond praise."

Thus in 1758 the period of his youth came to a close. He had inherited the estate of Mt. Vernon on the death of his brother Lawrence, and he soon afterwards married a charming and wealthy young widow, Mrs. Martha Dandridge Custis. He never had any children of his own, but to hers he was devoted. The education of the Custis children; the care of his large estate and numerous slaves; his office as vestryman in the parish church; his social pleasures and his duties as a member of the House of Burgesses, which met twice a year in Williamsburg, occupied his time most agreeably for the next 15 years. In accepting the call to public duty he gave up a very beautiful, complete and endearing domestic life for which no honors ever compensated.

In 1774 he was chosen a delegate to the first Continental Congress. Many remarkable men were there — Franklin and Jefferson and others — but Patrick Henry said: "In solid information and sound judgment Washington was the greatest man on the floor." It was Massachusetts, where the battle of Lexington was fought in April, 1775, that insisted a month later on the supreme command of the army being given to the Virginian colonel. When the appointment was offered to him, he replied that he was deeply honored, but honestly felt that he lacked capacity for so great a task. He refused pay for his services. He arrived in Boston late in June, after the battle of Bunker Hill. Beginning with an army of 17,000 untrained men, with few supplies, he had to attend, not only to his military duties, but to serve 14 masters — Congress and the 13 colonies — and to persuade all of them to support his operations and furnish men and supplies. It was an experience to make a great man, to break a weak one. When, in March of 1776, the British were driven out of Boston, Washington had become a statesman and a military commander of the first rank.

Washington's fame as one of "the greatest generals of history," as Frederick the Great called him, does not rest on the battles he fought. The greatest battle of the Revolution — probably the decisive conflict that turned the tide of war — was the battle of Saratoga when Burgoyne surrendered. Washington's retreat across New Jersey; the manner in which he turned and struck the pursuing enemy at Trenton and Princeton and then established himself on the heights of Morristown, overlooking New York; and the vigorous resistance to British occupation of Philadelphia at Chad's Ford and Germantown all marked him as a consummate military genius. That record was crowned by the terrible winter of 1777-8 at Valley Forge. In spite of the misery of his soldiers, the clamor of the people tired of war, the delays of a fugitive Congress and the scheme to have him superseded by General Gates, he held his strategic position, and held his starving, freezing army to its task. When, on the news of the French alliance, Philadelphia was evacuated to unite the two British armies in New York, Washington chased the enemy across New Jersey and shut them into New York. There he remained, watching, waiting, on the Hudson, while the British carried the war to the south. They captured Savannah and Charleston and entrenched at Yorktown, Virginia. Then, feigning an attack on the weak garrison in New York, he made a forced march to the Potomac, the French fleet appearing simultaneously in Chesapeake Bay. Three weeks later Cornwallis surrendered and the seven years' war was over.

In 1783 Washington returned to Mount Vernon, — he hoped to private life. But that was not to be. His canonization had already begun. The Revolution had brought forward a score of able, patriotic men, but in the six years' struggle to frame a constitution and establish a federal government Washington was the court of last appeal, his the deciding voice. "The office of president was cut to Washington's measure" is said by one historian. No one else was thought of. He was chosen unanimously in 1789 and again in 1793. A third term he refused, and thus established a precedent which no political party has since dared disregard. For eight years, and until the government was firmly established, he prevented the formation of political parties by Hamilton and Jefferson, allying himself with neither but keeping both in his cabinet. Two years after his retirement he died at Mount Vernon on Dec. 14, 1799. Chief-Justice John Marshall, in moving the resolution of national grief in Congress, uttered the immortal words: "First in war, first in peace and first in the hearts of his countrymen."

His place is not less to-day because he shares it with Lincoln — one the creator, the other the savior, of our country. We touch Lincoln at more points of human understanding and sympathy. He remains a warm personality. Washington's image tended once to grow remote and legendary. But we love and revere them equally. The final word as to Washington was said by John Richard Green, the historian of the English people, when he characterized Washington as "the noblest figure that ever stood in the forefront of a nation's life." Tennyson's word as to Wellington applies even more to Washington: "Whatever record leap to light, *he* never shall be shamed."

There are numerous biographies of Washington. Irving's *Life* is marked by its literary quality. Weems' *Life* was the earliest, and was the one possessed by Lincoln when he was a boy. Lodge's *Washington* in the American Statesmen Series is exceptionally helpful.

Washington and Jefferson College, at Washington, Penn., originated as Jefferson College (1802) and Washington College (1806), the two uniting in 1865 as Washington and Jefferson College. Thirty-one trustees control it, and are a self-perpetuating board. There are classical, engineering, French-scientific and Latin-scientific courses. The studies of the first two years of the classical, French and Latin courses differ, but in the last two years of each of these courses there are the same electives and the same required studies. The college possesses a preparatory department, and numbers 30 professors, 455 students and 20,000 volumes in its library. In 1907 its productive funds were $508,258 and its income $50,302.

Washington and Lee Univer'sity, Lexington, Va., was chartered in 1782 as Liberty Hall Academy. In 1796 George Washington endowed the school with $50,000, in recognition of which it was called Washington Academy and later, Washington College. At the close of the Civil War, Robert E. Lee was elected president and held this position until his death in 1870, after which the Assembly of Virginia changed the name of the institution to Washington and Lee University. Its faculty now numbers 34 and its students 500. It is noted for the great number of prominent public men it has graduated, and for the Lee Mausoleum in its chapel, containing the statue of Lee by Valentine.

Washington Elm. This is an ancient tree at the northwest of the Common, in Cambridge, Mass. Here Washington is reported to have stood when on July 3, 1775, he took the command of the American forces in the war of the Revolution.

Wasp (*wŏsp*), any one of a considerable group of insects, forming, with bees and ants, the highest order of insects (*Hymenoptera*). These well-known insects show some variation in form. Sometimes the thorax and abdomen are connected by a slender thread; but in other forms these parts of the body merge into one another. The social wasps, like the hornet or yellow jacket, are the best known. They build nests of paper attached to bushes, trees, roofs and eaves of buildings; or near the ground; or sometimes under stumps and stones. The paper is manufactured from wood-fiber obtained from posts and unpainted boards. This is chewed in the jaws and united into sheets, often of considerable extent. The nests are often top-shaped or balloon-shaped, with layers of cells inside resembling honeycomb, all inclosed in a spherical envelop of paper with a hole at the bottom for entrance and exit. The cells are hexagonal and in a single layer. In each cell one egg is placed; the larvæ, on emerging, hang head downward. The nests in tropical countries sometimes are six feet long. The species of social wasps that make nests in the ground form a more fragile sort of paper from decayed wood. The colonies include three forms: males, females and workers. The males and workers die on the arrival of cold weather but the females live over the winter in sheltered places, and start a new colony in the spring. The workers only have stings. The solitary wasps include miners, mud-daubers and carpenters. The mason-wasps or mud-daubers are the most familiar, as their mud nests are commonly seen on beams and walls. The carpenters cut tubular nests in wood and divide them by mud partitions. The miners dig tunnels in the earth. Young wasps as a rule are fed largely on insects, though fruit and flower juices are included in their diet. Caterpillars, other larvæ, grubs and spiders are stored away for future use. In all their work and habits wasps are of much interest. Consult Lubbock's *Ants, Bees and Wasps* and Howard's *The Insect-Book*. See HORNETS.

Wat Ty'ler, the leader of a rebellion in England in the reign of Richard II. A poll-tax was levied on every one over 15 years of age, which was very odious to the people When Walter the Tiler killed a taxgatherer who had insulted his daughter, the people were ready to rally around him. The insurgents numbered 100,000 by the time they had reached London, where they took possession of the Tower and put to death the Archbishop of Canterbury and others. The first demands of the rebels were granted, but Tyler grew insolent and was killed by the mayor of London (June 15, 1381). Richard II, in his 16th year, took command of the rebels, and succeeded in leading them back to their homes, but when they were once scattered the promises made to them were not kept, and many of them were severely punished.

Watch. See CLOCK.

Watch'making. With the invention of coiled springs as the source of power in time-pieces, it became possible to make them small enough to put in the pocket. Now that clocks also are made with springs, the difference between them and watches is simply a matter of size. The first watches were made, it is said, in Nuremberg about 1500, and on account of their shape and size were called Nuremberg eggs. The early watches were made in many curious shapes, and indeed, before the modern day of hurry and necessity for promptitude, they were of little use. To overcome the variations in power as the spring uncoiled, the fusee and chain were used, the fusee being the axle on which the chain was coiled. Watches were not exact, and had only an hour-hand till Hooke in 1658 invented the balance-wheel, including the hair-spring. It is used to take the place of a pendulum, which of course can not be used in a watch. The next step was the invention of the lever escapement about 1770, which applies the regulation of the balance-wheel with much more accuracy than had been attainable. The fifth important step was the invention of the compensating balance. Watches are more affected by changes in temperature than are clocks, and it was necessary so to arrange different metals in the balance that the contraction or expansion of one would offset that of the other. This invention (1764) made possible the exactness of the chronometer, which in turn enables sailors to tell their longitude with precision. Perhaps the invention of stem-winding and stem-setting to take the place of the key so easily lost deserves the sixth place. The latest development is the application of machinery to the manufacture of watches, and this was brought about by American ingenuity about 1854, when the celebrated factories at Waltham (*q.v.*) were established. Not only does machinery make the parts more exactly than hand-labor, but this exactness makes it possible to dispense with the fusee and chain. The American watch has about 153 parts to the 800 parts that had to be brought together in the British or the Swiss watch. Improved methods of hardening steel made jewel-bearings less important, and so the way was prepared for the "dollar watch." Before machinery was applied, the parts of any one watch had to be specially made for it; but now the parts of a watch never face each other till they are ready to go into the case together. Being made of standard sizes, they always fit. Watch manufactories are now scattered over the north of the United States, but the chief centers are in Massachusetts, Connecticut, New York and Illinois. England and Switzerland make the better, Germany the cheaper, watches.

Wa'ter (H_2O) is a clear, transparent liquid, formed of oxygen and hydrogen. It is almost colorless, though in large masses it looks blue. It freezes at 32°F. and boils at 212°F., and passes off in steam. Water dissolves almost everything it comes in contact with, so that strictly pure water is never found. Rain-water is the purest form, but even that has absorbed air and ammonia. Water is found very widely distributed in nature in the form of ice and snow, in watery vapor in the air, in lakes, rivers and seas, in the soil and rocks, in the sap and juices of plants and in the blood and flesh of animals. It covers three fourths of the surface of the earth, and forms a large part of the bodies of animals. The ocean is nature's great reservoir or cistern, and from it all other water may be said to be taken. A constant stream of vapor passes into the atmosphere and is condensed in colder regions, returning to the earth in the form of rain, dew, frost and snow, which fertilize the earth, are collected into pools, springs, lakes and rivers, and finally find their way back to the ocean. These waters all take up various substances, as is seen by the color of different rivers, which varies as the soil through which they pass. The water of the ocean is salt, but the saline or salty matter does not form a vapor, and so is left behind when the watery vapor rises from its surface. Besides its use in watering the earth and in feeding animal and vegetable life, water has been the great agent in forming the surface of the earth. A river carries with it a large amount of earthy matter, of which it has robbed the hills in which it springs, and deposits it in the valleys through which it flows; the great bars and deltas at the mouths of rivers being examples of the amount of land sometimes formed by the sediment in a river. This double process of breaking down and dissolving the rocks and of depositing and building up the land is constantly going on, and has been going on for ages. Geology gives the results of this constant action of water in past ages, as seen in the strata or layers of rocks which form the earth. In the form of ice or glaciers water has also had a large part to play in forming the continents. Some of the many purposes it serves are its use in supplying a motive-power to machinery, either mechanically, as in waterfalls, or by its expansion into steam, its use in cleansing and cooking or domestic purposes, its use in the laboratory as a solvent or dissolver of most substances and its universal use by men, animals and plants for drinking purposes. Consult Tyndall's *Forms of Water*. See GLACIERS, ICE, OCEAN, SEA, WATERFALL and WATERWORKS.

Water, Ascent of (in plants). Water to supply the evaporation from the larger land-plants enters by the roots, especially the root-hairs, and passes thence into the woody strands which lie in the center of the root. These connect with similar strands in the stem, which run into the leaves and branch profusely, following the so-called veins and constituting the veinlets. The water travels chiefly in the interior of the minute, elongated tubes (ducts or vessels) which make up the greater part of these strands. These ducts are not continuous tubes, however, so that the water has to traverse the partition walls which occur here and there (abundantly in pines and their kin). The water is not forced up from below by the roots, except in low plants and at some seasons; it certainly does not rise by capillarity. No satisfactory understanding of the forces concerned has yet been reached, though the problem has been attacked by many investigators. See ROOT-PRESSURE, TRANSPIRATION and VASCULAR BUNDLES.

Water-Bug, the name for a number of aqueous insects inhabiting the streams and ponds of the United States. They belong to the order of true bugs, that is, they have the mouth-parts in the form of a sharp stylet or beak for sucking. The water boatman is one form, swimming on its back. The water-stick is a long, slim, water-bug. Water-bugs are interesting to study in aquaria and may be collected with an insect net, sweeping the bottom of a pond and the submerged plants. The water scorpion, also sometimes called the electric light bug, is the most formidable of all the water-bugs. It is about two inches long, with sharp, pointed forelegs with which it catches small fishes and frogs and sucks their blood. It flies from pond to pond at night, and is attracted by strong lights. See Electric-Light Bug.

Wa'terbury, Ct., in New Haven County, 33 miles southwest of Hartford. It is on the Naugatuck River and surrounded by hills. It has a fine public park, a free library and other public buildings. It is known as the center of the brass manufacturing business of the United States, which began in 1802 with the making of gilt buttons. Electric wire, student-lamps, hinges, match-safes, clocks, watches, pins, hooks and eyes and percussion-caps are made by the million. Waterbury was settled in 1667. Population 73,141.

Wa'terfall or **Cat'aract,** a break in the slope of the bed of a river so abrupt that the water falls from the higher to the lower level. They usually occur in mountainous regions, where the streams flow from the mountain sides into valleys. The channel of the river must be rocky to form a fall, as the quantity of water would otherwise soon wear out a side channel. Some of the finest waterfalls are Orco Falls at Monte Rosa, 2,400 feet; Staubbach Falls in Switzerland, 1,000 feet; Zambezi Falls in Africa, 360 feet; Niagara Falls, 163 feet; and among the most wonderful in the world for their great width and the enormous volume of water which pours over them are the Falls of the Yosemite in California, 2,526 feet, the highest in the world.

Water-Lily, a general name applied to all members of the family *Nymphæaceæ*. They are aquatic herbs, native to all temperate and tropical regions. The stems are submerged, and the broad leaf-blades (lily-pads), on long petioles, float on the surface of the water. The true water-lilies are a species of *Nymphæa* or *Castalia*, the flowers being showy and of various colors. In the common species the petals are numerous and beautifully white and fragrant. The yellow pond-lily or spatter-dock is a species of *Nuphar*.

Wa'terloo', a village in Belgium, nine and a half miles southeast of Brussels, which owes its fame to the great battle fought in its neighborhood between Napoleon and Wellington, June 18, 1815. The French army numbered about 72,000 men, and Wellington's army numbered about 67,000, made up of British, German and Dutch troops. Napoleon supposed he had only Wellington's army to fight, as the Prussians had retreated before Ney on the 16th. But their retreat was toward Waterloo, and their arrival on the battlefield on the afternoon of the 18th turned the battle against the French, who, finding themselves hemmed in between the British and Prussians, fled in disorder. The roads southward were crowded with fugitives fleeing from the pursuing cavalry. One regiment of the guard which had covered Napoleon's retreat was surrounded and ordered to surrender; but their general, making the well-known answer: "The guard dies; it does not surrender," charged upon the enemy, and they perished almost to a man. The combined losses of this battle were about 50,000 men. Victor Hugo says the defeat of Napoleon was brought about by a rain the night before, which delayed the attack in the morning, thus giving the Prussian troops time to reach Waterloo; while others ascribe it to Grouchy's failure to obey orders. For a description of the battle see Hugo's *Les Miserables*. See Napoleon and Wellington.

Waterloo, Ia., capital of Black-Hawk County, on both banks of the Cedar River, which furnishes water-power for its industries, northeastern Iowa, 94 miles west of Dubuque and 105 miles northeast of Des Moines. It is on the Waterloo, Cedar Falls and Northern, the Illinois Central, the Chicago and Great-Western and the Chicago, Rock Island and Pacific railroads. It is the center of a productive agricultural country and the shipping-point for large supplies of grain and produce. Besides the repair shops of the Illinois Central Railroad, the city's industries include flour-mills, foundries, carriage and machine shops, sash, door and blind factories, agricultural implements, gas engine and automobile works and refrigerators. It has admirable parochial and public schools, two high schools, two business colleges, Our Lady of Victory Academy (R. C.) and school libraries. Population, 32,968.

Wa'termel'on, the fruit of *Citrullus vulgaris*, a species of the gourd family, and native to Asia and Africa. Over 60 varieties have been produced and catalogued.

Water-Ouzel. See Ouzel.

Wa'terspout', a phenomenon frequently observed in calm, warm weather at sea or on inland lakes, appearing under overhanging clouds, which, under certain influences, send downwards a funnel-shaped cloud, charged with vapor condensed from the atmosphere; and by its rotary indraught, on reaching the surface of lake or sea, it attracts upwards a body of water or scudding, saltwater spray. The waterspout usually lasts but a few minutes, though under certain weather-conditions and meteorological influences many of them occur together. The condition that predisposes their appearance is the unstable equilibrium of the air, coupled with a gyratory motion imparted to it, which writhes and twists the cloud-spout in its rapid, tapering whirl. When observed at sea, at their bases the ocean is always violently agitated and massed in heaps with a leaping or coiling motion. Contrary to current belief, waterspouts are little affected by being fired at with cannon.

Wa'tertown, Mass., a town in Middlesex County, embracing a group of villages, an attractive suburb of Boston and six miles west of it, on the Charles River and the Boston and Maine Railroad. The place has an early history, being settled in 1630, and two years later made a protest against arbitrary taxation, on the occasion of being called upon to aid the construction of a fort at Cambridge. In the Revolutionary War the second and third provincial congresses of the state convened here; while to Watertown many people of Boston, driven from their homes by the British, came to reside. A national arsenal is situated here, and besides its municipal offices it has a library. Its industries include many manufacturing plants, embracing paper and paper-bags, hosiery and knitted ware and automobiles. Population about 12,875.

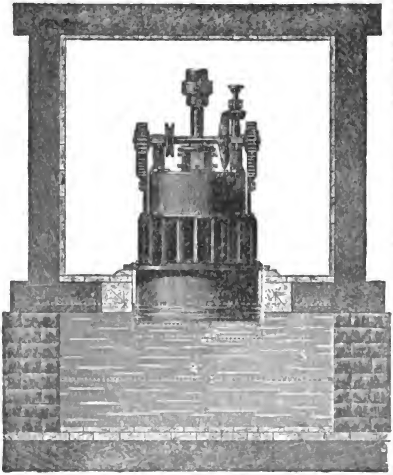
Watertown, N. Y., county-seat of Jefferson County, is on Black River, ten miles from Lake Ontario. The river crosses the city and falls 112 feet in about two miles, thus giving fine water-power for the manufactures of the place. Flour-mills, paper-mills, foundries, breweries, sewing-mahcine works and factories of paper flour-sacks, boots and shoes, cigars, carriages and sashes, together with the New York Air Brake works, are the most important of its manufactures. It also has a large trade with the fine agricultural region in which it is situated. The city annually expends $103,000 on its public schools, which have a force of 130 teachers and an enrollment of 4,600 pupils. It was settled in 1800, and became a city in 1869. Population 26,730.

Watertown, Wis., a city in Dodge and Jefferson Counties, is on Rock River, 35 miles northeast of Madison. It has a large trade and a number of manufactories, as flouring-mills, threshing-machine works, brick, furniture and shoe and box factories. It is the seat of Northwestern University, a Lutheran institution founded in 1864, and of the University of the Sacred Heart (R. C.), chartered in 1872. It has admirable public and parish schools, a free public library and some fine churches. Population 8,829.

Wa'terville, Me., a town on the right bank of the Kennebec River, 18 miles northeast of Augusta. Ticonic Falls give it a fine water-power, around which are clustered the factories of boot-shanks, sash and doors, shirts, furniture, carpets, paper and woolen mills. Electric power for light and transportation has also been developed, and the Maine Central railroad-shops, the most extensive in the state, are located here. It is the seat of Colby College, a Baptist institution, first organized as Waterville College. It has a library of 35,000 volumes, and several institutions of learning are located there, namely, Coburn Classical Institute; Ursuline Academy (R. C.); Mount Mercie Academy (R. C.). Waterville also has an excellent system of public and parish schools and school libraries. Population, 13,000.

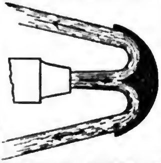
Watervliet (*wa'tẽr-vlēt*), **N. Y.** (formerly West Troy village, incorporated as a city since 1890), in Albany County, on the Hudson River, opposite Troy and a few miles north of Albany. Here, on a reservation, is Watervliet Arsenal, with its ordnance-constructing plant, powder and ammunition magazines, etc., owned and operated by the national government. The Barge Canal passes through the reservation, and the arsenal controls considerable wharfage on the Hudson. The town grows apace, and in civic institutions, as well as in residences, begins to assume the status of a city. Population 15,074.

Water-Wheel, a wheel so arranged as to transform water-power into rotary mechanical power. The work done is due to the force of gravity on the water, and the possible work is equal to the fall multiplied by the weight of the water. To get the maximum work it is necessary that the water shall enter without shock and leave the wheel without further fall and velocity, conditions which of course, can only be approximated. But water-wheels give efficiencies which rival that of other prime motors. Efficiencies of over 90 per cent. have been reached, while efficiencies of 75 to 85 per cent. are commonly attained in the best wheels. Water-wheels have been used from a very remote period in human history. Up to about 1825 practically all wheels used were of three types: overshot, undershot and breast wheels. These were wheels revolving on horizontal axes. They had buckets or paddles on the circumference. As the name implies, the water fell from above into the buckets of the overshot wheel, while in the case of the breast wheel the height of the water was about that of the axis of the wheel, and in the undershot wheel the water flowed below and moved the wheel by impact against the blades. The overshot and breast wheels commonly reached efficiencies of from 75 to 80 per cent., while the efficiency of the undershot wheel was much less. The above-named wheels are seldom used now, except in small powers and in old mills. The two kinds of wheels used to-day are turbine-wheels and impact wheels of the Pelton type. The turbine wheel was introduced into France by Fourneyron about 1827, and from there soon afterwards into England and the United States by Fairbain and by Boyden. The peculiarity of the turbine is that the water flows between curved channels, so that it impinges on the vanes or buckets of the turbine tangentially, and thus by force of reaction rotates the turbine. The vanes of a turbine are commonly warped surfaces, shaped for local conditions and according to the special ideas and experience of the designer. The older turbines revolved about a vertical axis, but many modern turbines have horizontal axes.



TURBINE-WHEEL

There are three methods by which the water has been led into the wheel: from the center outward, from the rim inward, and from above downward through the wheel. Turbines are smaller and have a higher speed of rotation than older kinds of wheels. They run with greater regularity, and their efficiency is equal to, if not greater than, most of the older wheels. An efficiency of from 85 to 90 per cent. is common. The most powerful turbines ever built are those for the Niagara Falls (*q. v.*) electric plant. There are ten of these, each with a capacity of 5,000 H. P. The water has a mean head of 136 feet and is led through a steel penstock 7½ feet in diameter. The wheels are 63 inches in diameter and make 250 revolutions per minute. The shafts of the turbines carry directly the revolving parts of the generators for this great plant. Since about 1880 a special form of water wheel, called the impact wheel, has been developed and introduced in California. The Pelton water-wheel is the best known of the impact wheels. It is used where the head is very great. A jet of water is led against the steel buckets on the edge of the wheel, and these are so shaped as to throw the water off to the side. Pelton wheels are used in practically all the long distance electrical transmission lines in California where the head is high. In the Fresno plant the water-head is 1,400 feet, and the Pelton wheels have an output of 1,000 H. P. The use of water-power in the world has been increased by the development of long-distance power-transmission by electricity. It is estimated that 5,000,000 H. P. in water-power can be made available in the United States by electric transmission, and a recent writer in *The Engineering Magazine* places the water-power of Italy that can be made available by electric transmission as over 1,000,000 H. P. The use of water-wheels is thus likely to increase. A. P. Carman.



NOZZLE AND BUCKET OF PELTON WATER-WHEEL

Water-Works, a system of pipes and conduits connected with reservoirs or pumping-stations for the supply of water to communities. The ordinary supply of water to communities where the population is scattered is from shallow wells, but in crowded cities such wells become very dangerous on account of the contamination of the water by impurities from the soil. The water-supply of large cities often forms a very difficult problem, and large reservoirs and long conduits often have to be built to get an ample supply of pure water. The common sources of supply are streams, lakes, springs and wells. If the water is derived from streams or lakes, the great difficulty is to get a drainage-area which has not been rendered impure by the refuse of the surrounding population. The water of New York City is derived from the watershed of the Croton River and is led into reservoirs in New York City (*q. v.*) through an aqueduct 29.6 miles long. This aqueduct has an average diameter of over 13 feet. (See *The Century Magazine* for December, 1889.) Chicago and Cleveland pump their water from the neighboring lakes, a tunnel of several miles being bored out under the lakes in each case so as to secure water free from shore refuse. Where the water for public supply is taken from wells, the wells are always sunk or driven several hundred feet into the lower strata, where the supply is more constant and is freed from surface impurities. Two systems of distribution are in use: the reservoir and the pumping system. In the reservoir system the water is collected by natural flow or by pumping into reservoirs and then distributed by gravity to the houses. In the direct-pumping system the water is pumped into the mains by pumps which are kept working day and night. The latter system is cheaper to install, but more expensive to operate. Where there is no natural elevation for a reservoir, it is common to erect a large, steel stand-pipe, which will have sufficient capacity to furnish part of a day's supply. The daily consumption of water in American cities is about 100 gallons per person. This is from two to three times the amount used in European cities. To check the waste of water, it is common now to supply water by meter, so that each user pays according to the amount consumed by himself.

IAN MACLAREN

Wat'son, Rev. **John** (*nom de plume* Ian Maclaren), one of the most popular of the Scotch school of story-writers and a prominent figure in English religious life, was born of Scottish parents at Manningtree, Essex, Nov. 3, 1850, and educated at Edinburg University and at Tübingen. Ordained a minister of the Free Church of Scotland, he had his first important charge at Free St. Matthew's, Glasgow, and afterward was transferred to the Sefton Park Presbyterian Church, Liverpool. Till 1893 Dr. Watson was known as an able and popular preacher; but in that year he acquired greater distinction and a wider fame by a series of Scottish prose idyls, written for *The British Weekly* and afterwards published under the title of *Beside the Bonnie Brier Bush.* This work won deserved praise for the fidelity with which he has portrayed humble and reverent Scottish life and scenes, and was deservedly dramatized. The volume was followed by *The Days of Auld Lang Syne*, *Kate Carnegie*, *A Doctor of the Old School*, *Rabbi Saunderson* and *Afterwards and Other Stories*. His religious writings embrace *The Upper Room*, *The Mind of the Master*, *The Cure of Souls*, *The Homely Virtues*, *The Inspiration of Our Faith*, *The Potter's Wheel* and *Companions of the Sorrowful Way*. In 1896 and again in 1899 he visited the United States on lecturing tours, and delivered the Lyman Beecher lectures at Yale University on practical theology. He also visited the United States in 1907, where he died at Mount Pleasant, Iowa, May 6.

Watson, John Crittenden, American naval officer (rear-admiral in command of the Asiatic station, with pennant on United States battleship *Oregon*), was born at Frankfort, Ky., Aug. 24, 1842, entered the United States Naval Academy in 1856, and graduated in 1860. From 1862 to 1864 he acted as aid to Admiral Farragut on the *Hartford*, and took part in forcing the Mississippi River and capturing New Orleans; he was wounded at the battle of Mobile Bay. From 1865 to 1867 he served on the *Colorado* in the European squadron, and was promoted to commander in 1874, to captain in 1887, and to commodore in 1897. In the war with Spain he commanded the blockading squadron on the northern Cuban coast on the *Newark*. In June, 1898, he was given command of a squadron designed to operate against the coasts of Spain, but the collapse of the war rendered the project unnecessary. In June, 1898, he was appointed commander-in-chief of the eastern squadron.

Watson, Thomas (1557-1592), was one of the English lyrical poets who inaugurated the great outburst of Elizabethan literature. He is known to have attended Oxford University and to have studied law in London. He was an elegant and celebrated Latinist. His Latin translation of the *Antigone* of Sophocles appeared in 1581. He also translated Tasso's *Aminta* into Latin pastoral form. His English works include the *Tears of Fancy*, a beautiful collection consisting of 60 sonnets, some of which appear to have been utilized by Shakespeare. Watson also wrote a book of 100 professed sonnets, which had 18 lines each instead of 14; this he called *The Passionate Century of Love*. His themes are largely from the French and Italian. His English verse is published in Arber's *English Reprints*.

Watson, William, an English poet, born at Burley, Yorkshire, on Aug. 2, 1859; his writings have given him prominence of recent years. *Epigrams of Art*, 1884, was his first book to attract attention. In *The National Review*, 1885, he published a series of sonnets entitled *Ver Tenebrosum*, in which he attacked the English policy in Egypt. In his poem on *Wordsworth's Grave* gave him considerable fame. His verse is careful, delicate and sure in workmanship, and is reflective in tone. His sonnets in *The Purple East*, are noteworthy, while *The Year of Shame* is a forceful indictment of England's policy in the Orient.

Watson, William, an American scientist, was born in Nantucket, Mass., 1834. He was graduated at Harvard, 1857. In 1860–63 he gathered information which was used in 1864 in founding the Massachusetts Institute of Technology. He was professor of mechanical engineering and descriptive geometry in this institution during 1865–1873. He became secretary of the American Academy of Arts and Science in 1884.

JAMES WATT

Watt, James. Everybody has heard the story of James Watt and his boyhood experiment of the lifting power of the steam under the lid of his mother's teakettle. What boy's heart has not swelled with indignation when reading of his good aunt's rebuke for the lad's idleness! Whether this story be true or not, no less a person than Andrew Carnegie says we should cherish it among our most precious legends, along with the stories of Washington and his hatchet and Bruce and the spider, because it condenses an inspiring genius into an illuminating anecdote.

It is a beautiful picture, that of the home-life of James Watt, in the fishing-town and customs-port of Greenock, Scotland. Born there on the 19th of January, 1732, a delicate, sensitive lad whose life was preserved only by the most tender care, he was fortunate in having a father of means and importance, a comfortable, tranquil home and a mother who was known to the fisher-folk as "the beautiful leddy." Unable to attend school regularly because of ill-health, he followed his own inclinations in study and amusements. Long days were spent in rambling among the hills and lakes back of the town, developing strength and turning his thoughts toward botany, geology and water-power. He was no less interested in his father's shipbuilding yards and in the docks. He loved to sit in the window of the parlor fronting the harbor and watch the herring-boats come in and the big sailing vessels laden with tobacco from Virginia, riding at anchor in the broad estuary of the Clyde. Who could imagine that this fragile, dreaming boy was to transform his native town from a straggling village of thatched cottages into a big, bustling seaport with shipbuilding yards that construct the Cunard and other famous lines of steamers?

From the age of 14 natural philosophy, chemistry and anatomy interested him intensely, and he lost no opportunity to put every statement made by books to the test in nature's great laboratory. In his father's shops he became so skilful in the use of tools that the workmen said of him: "Wee Jamie hae a fortune in his fingers, an' anither in his heid." Because he could not always have tools to use, he set up a forge of his own and made and repaired tools for himself. The mathematical exactness and thoroughness of his work there were the foundations of his future inventions and fame. It was intended that the gifted boy should go to Glasgow University and be fitted for a professorship in physics. The Scotch people, perhaps, have a profounder love and respect for learning, and will make greater sacrifices to get an education, than any other people on the globe. So, when the ambition of the Watt family for Jamie had to be put aside because of the loss of a vessel at sea and other financial misfortunes, the disappointment must have been bitter indeed. The lad went to London at 19 to learn the trade of scientific instrument-making — rulers, compasses, scales and such things, for which he showed talent. It took 12 days' hard riding on horseback to make the journey of 400 miles. To-day the distance is covered in nine hours.

Within a year he was back in Glasgow, a competent workman, but poor and sick, with work so scarce that he was barely able to earn his bread. Repairing the astronomical instruments for the university led to his appointment as mathematical instrument-maker, with a shop in the college precincts. He was very little better off in the way of money than before, but the connection brought him the friendship of learned professors and the handling of complex instruments and machinery, every one of which involved the study of physical laws. For instance: the putting of a piano in order led him into acoustics. So James Watt's fingers were all the time educating his "heid."

So much reliance was placed upon his skill and his understanding of principles that a small model of a steam-pump was put into his hands for repair. The first thing Watt did was to make a thorough investigation of the whole subject of steam, including condensation and latent heat, to see why this pump, then used in British coal-mines, used so much steam and got so easily out of order. In a word, he set about the task, not of repairing, but of improving and developing a crude and wasteful contrivance. It took a year of close study. But let the inventor tell the story: "One Sunday morning when I had gone for a walk in the Green of Glasgow, the idea occurred to me that, as steam is an elastic vapor, it would expand and rush into a vacuum. The *separate condenser* would take care of the exhaust, and the steam-jacket keep the cylinder hot. I rushed back to the university and broke in upon Dr. Robison, lecturer on chemistry and cried: 'You needna fash yoursel' aboot that ony more, mon; you shall have steam boiling hot, in a boiling hot cylinder, and not waste a particle.' " The stationary steam-engine had been born in James Watt's brain — a flash of genius, it has been called. Such it was, but it was the result of profound knowledge, intense application and patience.

Now, at this stage, James Watt's skilful fingers came again to the service of his head. The practical difficulties were enormous. Money and powerful friends were forthcoming, but the necessary mecnanical skill for making all the parts true did not exist. The inventor had, literally, to invent other machines and to train workmen. It was ten years before the steam-engine was brought to perfection and protected by patents. Even then people refused to believe that it was anything more than a steam-pump limited to pumping water out of mines and for use in water-works. Sir Richard Arkwright was one of the first to set the stationary engine to the task of driving the machinery of his cotton-factory. During the next 30 years the engine was brought to perfection and applied to every practical use. The steam-gauge and governor were added. The inventor's partner in manufacturing engines was Matthew Boulton of Birmingham. Their sons succeeded them in business.

At 64 James Watt, having, as he said, "a sufficient fortune," retired to the country and spent nearly 20 years as an experimental philosopher and physicist, — in his many interests and activities resembling our own Benjamin Franklin. "What is life without a hobby to ride?" he is quoted as saying. He always had some scientific hobby to engage his inquiring mind. Now it was the composition of water, now an illuminating gas; again, a uniform system of weights and measures or the fertilizing of his broad farm-lands. At the very last he perfected a machine for copying statuary, presenting antique busts to his friends "from Jamie Watt, a promising young artist just entering his 83d year." With the eagerness of a boy he experimented in his laboratory on his rural estate near Birmingham, "wearing out my life, not rusting," until he fell asleep on the 19th of August, 1819. A monument to his memory was erected in Westminster Abbey. The poet Wordsworth calls Watt "in the magnitude and universality of his genius the most extraordinary man England ever produced. He never sought display, but was content to work in that quietness and humility in which all that was truly great and good was ever done." See *Life of James Watt* by Andrew Carnegie

HENRY WATTERSON

Wat'terson, Henry, American journalist and Democratic politician, was born at Washington, D. C. Feb. 16, 1840, and was educated by private tutors. Early in his career he took to journalism and at Nashville, Tenn., edited *The Republican Banner*. During the Civil War he served on the staff of the Confederate army and was chief of scouts under Gen. Joe Johnston. He subsequently settled at Louisville, Ky., where he founded and has since edited *The Courier-Journal*, which he has made one of the foremost Democrat newspapers. During 1875–7 he was a member of Congress, but, though repeatedly urged, he has uniformly declined office, and has contented himself with presiding over conventions and supporting his Democratic friends and allies in their political contests. At Chicago, in 1893, he delivered the dedicatory oration at the opening of the Columbian Exposition. In 1896 he declined the offer of a nomination for President on the National (gold) Democratic ticket. He has published a *History of the Spanish-American War*, and edited *Oddities of Southern Life and Character*.

Watts, George Frederick, R. A., a noted English artist, sculptor, portrait-painter and delineator of historical subjects, was born at London on Feb. 23, 1817. He first exhibited at the Royal Academy in 1837, his early pictures winning attention by their colossal size as well as by their artistic excellence and beauty of coloring. His chief exhibits have been *St. George and the Dragon*, *Fata Morgana*, *Life's Allusions*, *Endymion*, *Love and Death*, *The Good Samaritan*, *Hope*, *Sir Galahad*, *Orpheus and Eurydice*, with portraits of *Tennyson*, *Browning*, *Gladstone*, *Lord Lytton*, *Matthew Arnold*, *Holman Hunt*, *Swinburne*, *Dean Stanley*, *Garibaldi* and *John Stuart Mill*. *Love and Life* was later presented to the United States, and is in the White House. In 1867 Watts was elected an academician. He died at London on July 1, 1904.

Watts, Isaac, an English hymn-writer, was born at Southampton, July 17, 1674. He is said to have written hymns for his mother when seven or eight years old. He became a clergyman, and was pastor of Mark Lane Congregational Church, London, for a number of years, having an assistant and preaching only occasionally, as his health was permanently injured by overstudy when a young man. In 1712 a visit to Sir Thomas Abney, a London alderman, led to making his home with this friend for the remainder of his life. He wrote a number of theological works, a treatise on *Logic* and a volume on *The Improvement of the Mind*, which has been much used as a textbook. His reputation, however, is due to his hymns, of which he published three volumes. A large number of his hymns and psalms are retained in church collections, many of them our best-known hymns, as *Before Jehovah's Awful Throne; O God, Our Help in Ages Past; Joy to the World, the Lord has Come;* and *Come, Holy Spirit, Heavenly Dove.* His beautiful cradle-hymn, *Hush, My Dear, Lie Still and Slumber*, perhaps is the best known of his children's songs. He died on Nov. 25, 1748. Consult Hood's *Life* and Julian's *Dictionary of Hymnology.*

Wauke'gan, Ill., county-seat of Lake County, on Lake Michigan, is 35 miles north of Chicago. It is built on a bluff on the shore. On account of its mineral springs and pleasant situation, it is quite a popular summer-resort. There are several important industries, among them a sugar-refinery, wire-mills, brass-works, scale-works, sash and door, organ-stop, envelope and wire-fence factories, a planing-mill, a coal-dock and a salt-dock.

At North Chicago, a village a few miles south on an electric railway, are large zinc-works, a foundry, a hardware-factory, a brass-factory, and here the government has a naval training-school. North Chicago has a population of 2,000; Waukegan of 16,069.

Waukesha (*wa̤'kė-sha*), **Wis.,** county-seat of Waukesha County, a city of Wisconsin, 17 miles west of Milwaukee. Is one of the most popular health-resorts in the country. It is served by three railroads, has electric communication with Milwaukee and other cities, and contains large malleable iron and steel works. There are ten mineral springs, the Bethesda being the largest and the first discovered, in 1868. The water is shipped to all parts of the world, the works covering 20 acres. There are a very large hotel and fine bathing-houses, with beautiful parks and drives. Population 8,740.

Wau'sau, Wis., a city on the Wisconsin River, the capital of Marathon County, central Wisconsin. It is on the Chicago, Milwaukee and St. Paul and the Chicago and Northwestern railroads, and is 180 miles northwest of Milwaukee. It lies in a heavily timbered pine-belt, and its industries, consequently, are chiefly mills for dressing lumber and the manufacture of furniture, sashes, doors and blinds, together with planing-mills. It also has machine-shops, foundries, tanneries and cigar factories, besides mining and granite-quarrying. The city is growing rapidly, is being connected with adjacent towns by electric street railway, is in the center of a fine dairying country. Marathon County is said to have the finest herd of Guernsey cattle in the world. Population 16,560.

Wave-Mo'tion, a state of disturbance being propagated from one part of a medium to another. A body is said to be *disturbed* when it is thrown out of equilibrium. Thus a stone dropped into quiet water produces a disturbance which at a later instant may reach a point several yards away. And since a body is in equilibrium only when its potential energy is a minimum, a disturbance implies the addition of energy to the system. Indeed, wave-motion might be defined as one of the two principal methods for distributing energy, the other being *currents.*

In any consideration of wave-motion, it is quite important to distinguish carefully between the motion of the wave and the motion of the particles of the medium through which the wave is traveling. Waves are roughly divided into two classes according to the motion of the particles. If these motions occur in the same direction in which the wave is traveling, the wave is said to be a *longitudinal* one; but if the particles are displaced in a plane which is perpendicular to the direction of propagation, the wave is said to be *transversal.* If the period of vibration of one of the disturbed particles of the medium is T, and the length of the wave be λ, then the speed of the wave V is given by the following equation:

$$V = \frac{\lambda}{T}$$

This is a perfectly general expression, true for all kinds of waves whatsoever.

Following is an outline of some of the more important types of waves met with in nature:

Water-Waves. These are the ordinary waves encountered at sea and at the seashore. They really are due to gravitation, which tends to pull down the crest and elevate the trough of a disturbance as if the surface of the water were elastic. They are more properly called *surface waves.*

The motion of the small particles which make up the water must be carefully distinguished from the motion of the waves. The motion of the particles in surface waves is in a circle, which gives to the outline of the wave a form very approximately that of a trochoid. The speed with which water waves travel depends very greatly upon the depth of the water.

If the depth of the water is greater than half a wave-length, the speed of a wave is $\sqrt{\frac{g\lambda}{2\pi}}$, where g is the acceleration of gravity and λ is the length of the wave. The longer the wave, therefore, the faster it travels. But in the case of shallow water the speed of the wave is

$\sqrt{gh}$, where g, as before, is the acceleration of gravity and h is the depth of the water. The speed of waves in shallow water is, therefore, independent of wave length.

Ripples. In the case of water waves which are very short — say less than about 4 millimeters — the surface tension (*q. v.*) of the water is the principal factor in determining the speed of the waves, which is $\frac{2\pi T}{\lambda\rho}$, where T is the value of the surface-tension, λ the wave length and ρ the density.

The slowest of all waves are those which are about 16 millimeters long. Waves shorter than this are called ripples. It is important to note that the speed of ripples, unlike that of waves, varies *inversely* as the wave-length.

Waves in Stretched Strings. These waves are seen when a stretched clothes-line is struck with a walking stick. They occur also in all stringed musical instruments and often in long belts in power-houses. The speed of the wave here depends upon two factors only: the tension or the force with which the string is stretched, say F, and the mass per unit-length of the string, say μ.

Then

$$Speed = \sqrt{\frac{F}{\mu}}$$

Sound Waves. These travel in gases, liquids and solids. The character of these waves is described in ACOUSTICS. There also will be found the evidence for thinking that sound is a wave-motion.

The speed of sound-waves in air was first computed by Newton and Laplace, and found to be as follows:

$$Speed = \sqrt{\frac{\gamma p}{\rho}}$$

where p denotes the pressure of the air, ρ its density and γ a constant, *viz.*, the ratio between the specific beats of air at constant pressure and at constant volume.

In the case of a sound-wave traveling in water we have

$$Speed = \sqrt{\frac{\textit{Bulk Modulus}}{\textit{Density}}}$$

But in case sound travels through a solid rod, as, for instance, a fence made of gas-pipe, we have

$$Speed = \sqrt{\frac{\textit{Young's Modulus}}{\textit{Density}}}$$

Light Waves. The evidence that light consists of a wave-motion is presented in LIGHT. Concerning the nature of light-waves very little is known; but it used to be thought that they were elastic disturbances in a solid ether, in which case the speed of light waves would have been given by the following equation:

$$Speed = \sqrt{\frac{\textit{Rigidity of Ether}}{\textit{Density of Ether}}}$$

It is now generally believed that light consists in electrical disturbances of the ether, in which case the speed of light waves would be determined as follows:—

$$Speed = \sqrt{\frac{1}{\mu\kappa}}$$

where μ is the magnetic permeability of the medium and κ the specific inductive capacity of the medium.

Besides these, there are many other kinds of waves, as the tides, barometric waves, temperature waves, solitary waves etc., the discussion of which is beyond our limits of space. For these, as well as the composition of waves, stationary waves etc., the larger treatises must be consulted. One of the best of these is Lamb's *Hydrodynamics.* HENRY CREW.

Wax is a solid, fatty substance of animal and vegetable origin. It is harder than fat, and does not melt so easily. It will not dissolve in water, and burns with a bright flame. Bees' wax, Chinese insect-wax and spermaceti are animal waxes, while Japanese wax, palm-wax and myrtleberry-wax are vegetable waxes. Bees' wax is secreted by the bees, and forms the cells in which they store honey. It is prepared by draining out the honey, melting the comb in boiling water, and collecting the wax from the top of the water as it cools. It is, in its natural state, a light yellow color, and is made into white wax by bleaching. It is produced in large quantities, and used mainly for the manufacture of candles. Chinese wax is supposed to be the product of an insect. It is found as a thin white coating on the branches of certain trees, and is removed with boiling water. It is white like spermaceti, and is used for candles. Japanese wax is got from the fruit of a tree by boiling it and collecting the wax; palm-wax is scraped from the branches of two kinds of South American palms; and carnauba wax is found on the leaves of the carnauba palm, and is obtained by drying the leaves and shaking off the wax like dust. Myrtleberry-wax or candleberry-wax is made from the berries of the wax-myrtle or bayberry, and, as it burns about as well as bees' wax and costs only a quarter as much, it is largely used. Mineral wax is a substance found oozing in small quantities from rocks in coal regions. Paraffin, produced from shale and petroleum, is also much used as a wax for candles etc. See BEES, PARAFFIN and SPERMACETI.

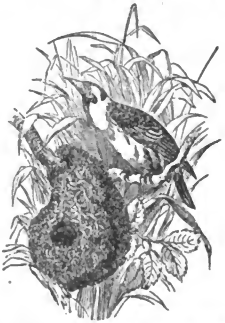
Wax'wing', the name for birds having the wings, at times, ornamented with small spots that look like red sealing-wax. There are two species in North America, the cedar-bird and the Bohemian waxwing. The former nests from Virginia to Labrador, and is found in winter from Massachusetts south to Costa Rica. It is about 7.2 inches long, with a plumage grayish brown above and yellowish below. There is a black stripe running across its face, and the head is crested. The secondaries of the wings are sometimes provided with red, wax-like tips. These birds live in flocks and fly in close rank. Their food varies with the season, but consists largely of cedar-berries, soft fruits and insects. The Bohemian waxwing is a more northern bird, but is found south in winter. It is slightly longer than the cedar-bird, and has a distinct purple cinnamon color on the head. Similar birds are found in Europe.

Way'land, Francis, an American clergyman, was born at New York, March 11, 1796. He graduated at Union College, and studied both medicine and theology, becoming pastor of a Baptist church in Boston. In 1826 he was made president of Brown University, Providence, R. I. He was one of the first teachers to make the study of Greek and Latin a matter of choice in a college course. He is well-known as a writer, his works on moral science and intellectual philosophy having been quite generally used as textbooks. He died at Providence, R. I., Sept. 30, 1865.

Wayne (*wān*), **An'thony,** American general, was born at Waynesborough, Pa., Jan. 1, 1745. He became a surveyor and was selected by Benjamin Franklin to form a settlement in Nova Scotia. When the Revolutionary War began, he raised a regiment of volunteers, and served first in Canada, at the battle of Three Rivers, and in command of Fort Ticonderoga. While with Washington in New Jersey, he commanded the rear-guard at Brandywine, led the attack at Germantown, captured supplies for the army at Valley Forge, and surprised the garrison at Stony Point on the Hudson, one of the most brilliant operations of the war, for which he received a gold medal and the thanks of Congress. In Virginia he saved Lafayette's forces, and assisted in the capture of Cornwallis. He was made major-general and commander-in-chief in the war against the Indians in 1792, and was made the commissioner to treat with the Indians and to take possssion of the British forts in the northwest. He gained the title of Mad Anthony by his dash and bravery. He died on his western expedition at Presque Isle (now Erie), Pa., Dec. 15, 1796. Consult *Life and Services* by Moore and Sparks' *American Biography.*

Weasel (*wē'z'l*), the name of a number of small, carnivorous mammals related to the **sable,** mink and skunk, the smallest members of the marten family. They have a remarkably slender, round body with a long neck, which gives the animal the appearance of having the fore legs set back too far. The legs are very short. The weasel can twist and wind its supple body in a fashion very like a snake, and enter holes where only a snake could follow. The common weasel, found both in the Old and the New World, reaches a length of eight or ten inches; it is light, reddish brown and whitish below, and in northern districts becomes whitish in winter. It feeds on mice, moles and rats, following them into their holes, and even rabbits, grouse, chickens and ducks the bold creature attacks. It also visits birds' nests, is reputed to kill for the pleasure of killing, and is called bloodthirsty and wasteful. It ranges in America east of the Rocky Mountains, and south to the border of the southern states. The stoat or ermine likewise inhabits Europe, Asia and America, ranging east of the Rocky Mountains, from the extreme northern limit of terrestrial animals to the southern states. It is eight to eleven inches long. In summer its color is mahogany brown, with a black tip to the tail. In winter it changes, in northern regions, to a pure white except at the tip of the tail, which remains black. Other examples are the brindled weasel of the western coast, found from California to Ecuador, and the long-tailed weasel of the northwest.

Weav'er-Bird, the common name for a number of sparrow-like birds that show especial skill in weaving their nests. This is so thoroughly fixed a characteristic, that they keep up their weaving habits in captivity when material can be obtained, even weaving fibers about their cages. There



YELLOW-CROWNED WEAVER AND NEST

are about 250 species of this bird, belonging mainly to Africa. Those outside of Africa inhabit the oriental region and Australia. There are none in New Zealand or America. They are small birds, usually of plain colors, but the males become brightly colored during the breeding season. The nests, while varying greatly in size and solidity, all bespeak remarkable skill in construction. Some of the weavers construct hanging nests, shaped like a pouch and suspended from high, slender branches. They are closely woven and elongated into a tube opening from below. The social weavers of South Africa are the most noteworthy. A number of birds unite in building an umbrella-shaped structure of coarse grass to form a protection for their nests. The individual nests are placed below this roof and open downward. The roof not only sheds the rain, but enemies like snakes and other animals will slip from it in attempting to get to the nests. As many as 800 or 1,000 nests have been found under a single canopy. Year after year the nests are added to; sometimes they break the branches by which they are supported.

Weav'ing, the art of making cloth by interlacing threads of any substance, as cotton or wool. The machine employed is a loom, which has been improved from the simple hand-looms of the Egyptians and other ancient nations to the complicated machines used at the present time in weaving silk, cotton, carpets and other woolen goods. The introduction of the power-loom instead of the hand-loom dates back two centuries, the first successful one being the invention of Cartwright in 1784, of which the Jacquard loom is the most important improvement. The process of weaving is seen best in the common mode of darning, where a set of lengthwise threads are first fastened firmly and then crossed by other threads, which are woven in and out by taking up one thread and leaving one. In weaving, the threads are fastened in the loom, as many as are necessary for the width of the goods. This is called the warp. The cross thread is wound on spools or bobbins in a shuttle, and forms the weft or wool. By a movement of the loom the alternate threads are raised and the shuttle passes between the two sets of threads. In hand-looms the shuttle is thrown by hand, but moved by machinery in the power-loom. The raised threads are then lowered and the lower threads raised, and the shuttle returned to the side whence it came, crossing in this way the threads alternately. The thread in the shuttle is thus carried back and forth, forming the well-known "selvedge" to woven goods. When every other thread is taken up, it is called plain weaving, but there are many varieties introduced, as taking up one thread and leaving two or three etc. The quality of the threads also varies, making wool goods with cotton or silk warp, velvet with silk or linen warp etc. The colors and figures are sometimes stamped on plain goods, when the "wrong side" will present a plain surface; in other goods they are made in the weaving by the use of colored threads. Consult Watson's *Theory and Practice of the Art of Weaving.*

Webb, Alexander Stewart, American general and since 1869 president of the College of the City of New York, was born at New York, Feb. 15, 1835, and graduated in 1855 at West Point, when he entered the United States army, artillery branch. In the Civil War he served in the army of the Potomac, was chief of staff of the fifth corps in the Maryland and Rappahannock campaigns, was wounded at Gettysburg, where he commanded a brigade, commanded a division in the Rapidan campaign, and led a brigade at the battles of the Wilderness and Spottsylvania (being severely wounded at the latter), and was chief of staff to General Meade till the close of the war. He subsequently held several important army posts until he retired from the army in 1870, acting also as a professor at West Point, until appointed president of the College of the City of New York. He is the author of a work on McClellan's campaign of 1862, entitled *The Peninsula.*

Webb City, Mo., situated in Jasper County on the Missouri Pacific and the St. Louis and San Francisco Railroad, with electric trolley communication with Joplin (six miles distant). It lies near Carthage and about 160 miles south of Kansas City, and is engaged chiefly as a mining center, with a large number of iron, lead and zinc mining plants in and about the city. In the vicinity there also is a fine farming and fruit-growing region. Its institutions embrace, besides public buildings, several banks, newspapers, schools and churches, together with theaters and opera-houses. In addition to the iron-works industry of the city, it has a foundry and machine shop and a flour-mill. Population, 15,000.

Weber (*vā'bĕr*), **Karl Maria von,** a German composer, was born in Holstein, Dec. 18, 1786. He early showed the musical genius which he inherited from his father. By the time he was 14, he had already composed two operas, the second one, *The Forest Maiden*, being put on the stage. He held several positions, such as conductor of the opera at Breslau, musical instructor in the family of Duke Louis at Stuttgart, director of the opera at Prague and at Dresden and musical director to the king of Saxony. His work includes operas, symphonies and overtures for the piano, clarionet, oboe, bassoon and violoncello and a large number of songs, among them a series of national songs from Körner's *Lyre and Sword*, which roused the patriotic sentiment during the war of liberation. His best opera, *Der Freischütz* (The Archer), was produced in 1822 at Berlin, and created a great sensation throughout Europe, so that Charles Kemble asked him for an opera for the English stage. *Oberon* was written in answer to this request, and brought out under his own direction at London in 1826, where he was greeted with enthusiastic applause. He died while on this visit to England, June 5, 1826. Consult *Life* by his son, translated by Simson.

Weber, Wilhelm Eduard, who has been called the Nestor of German physicists, was born at Wittenberg on the 24th of October, 1804. At the suggestion of Gauss he was appointed professor of physics at the University of Göttingen; but in 1837 he was compelled to resign on account of antagonism to the state authorities. Living for the next six years as a private citizen, he was in 1843 appointed to the chair of physics in the University of Leipsic; but he was recalled to his old post in Göttingen in 1849. The volume on *The Theory of Waves* (Wellenlehre), which he published with his brother, E. H. Weber, in 1825, is the first scholarly, experimental treatment of water-waves in existence. But perhaps Weber's chief service to science was the introduction of the absolute system of units into physical measurement — a work which he performed conjointly with Gauss. The invention of the earth-inductor and of the electrodynamometer is also due to Weber. As early as 1833 Gauss and Weber had connected the observatory and physical laboratory at Göttingen by means of a telegraph line. Weber died at Göttingen, June 23, 1891.

Web'ster, Mass., a town, embracing a group of villages in Worcester County, on the French River and on the Boston and Albany, Southern New England and the New York, New Haven and Hartford Railroads, 16 miles southwest of Worcester. Incorporated in 1832, the town owns and operates its local waterworks, and, besides its municipal buildings, has a public library, good schools and attractive churches. Its chief industries, in addition to those connected with the railroads, embrace cotton and woolen mills, shoe-shops, etc. The gas and electric company furnishes light and power to all towns within a radius of 15 miles. A lake of 1,200 acres in the neighborhood provides an additional attraction. Pop., 12,381.

Webster, Daniel. In January, 1830, an event of historical significance occurred in the United States senate. "Black Dan" Webster, senator from Massachusetts, delivered a speech that made him the Nestor of American orators in the golden age of American oratory. It was made in reply to a speech by Senator Hayne of South Carolina, who had declared that the Federal government was but a loose confederation of sovereign states and that the states could refuse to obey laws of Congress. Webster and President Jackson, who was at odds with his own party on this question, saw the dangers of this doctrine of nullification and joined hands across party lines in patriotic determination to stamp it out.

DANIEL WEBSTER

Webster rose to speak to packed galleries. In appearance he was grave and dignified, with the noblest head America has produced. He was smooth-shaven, heavy-featured, with swarthy skin, brilliant eyes and beetling brows. His rich voice had the range and melody of a chime of bells. The simplest man could follow his plain diction, while his logic and weight of argument delighted and convinced the most learned. He showed clearly that the doctrine of nullification could lead, logically, only to disruption and civil war. The speech was a defense of the Federal constitution and an appeal to national patriotism. It lifted the whole question of states' rights from the plane of a political theory to that of national ethics. One who heard it said: "That is the greatest oration since Demosthenes' *On the Crown*."

The man who made it was born on Jan. 18, 1782, at Salisbury, N. H. How often, in reading the lives of great men, do we find them so frail in childhood that it was not thought probable they would live to maturity! Daniel was so delicate that he was the only member of a pioneer family who was exempt from hard labor. His mother, a woman of uncommon intellect and force, early discovered the boy's remarkable mental powers, taught him all she knew and insisted upon his entering the local academy. When he was 15 it was decided at a family conference, that he must go to college, no matter at what cost of toil and self-denial of the others. The sensitive boy burst into tears at this proof of devotion and confidence in his ability. In order to repay it, in part, when he graduated from Dartmouth College, he taught in an academy in order to send his brother, Ezekiel, to college. When admitted to the Boston bar in 1805, he located in the small town of Boscawen, N. H., in order to be near his father, who died a year later. Returning to Boston, he established a good practice, only to turn it over to his brother and to begin again in Portsmouth. American history records no finer example of family affection and loyalty than is furnished by the Websters. "Black Dan's" loyalty was wide as well as deep. In a Fourth of July oration, delivered at the age of 18, he made an impassioned appeal for love of country, in a time when the people as a whole had scarcely outgrown their strong sense of separate, colonial origins.

So shy as a child that he could not stand up in school to speak pieces, Webster won such a reputation for eloquence at the bar that, at the age of 30, he was a member of Congress for New Hampshire, remaining four years, retiring to return to the Boston bar. His income soon rose to $20,000, a great sum in those days, and his reputation became national with his winning of the famous Dartmouth College charter case. In 1816 the New Hampshire legislature changed the charter given by King George III in 1769. The trustees appealed to the United States supreme court, and Webster won the suit on the contention that a state is forbidden to alter contracts. The decision was of national importance, because it asserted the authority of the Federal government over the states, and was a blow at the theory of states' rights. As a criminal lawyer, Webster won celebrity in his defense of a man named Knapp, on the charge of murder. In his summing up of the defense occurs the famous passage on conscience that has been declaimed by three generations of school-boys. The strength of Webster's arguments always lay in their being based on fundamental moral principles, whether they were delivered before the bar or in public orations. In this early period he made a trio of historical orations — one in 1820 on the second centennial of the landing on Plymouth Rock, one on the laying of the corner-stone of the Bunker Hill monument and one on the deaths of Adams and Jefferson, that served still further to place himself and his broad patriotism before the American public. Such a man could not escape the duty of public service. In 1823 he was again in Congress, this time for Massachusetts. In 1828 he was chosen to represent Massachusetts in the senate, and there he remained until his death in 1852, except while serving as secretary of state under Harrison and Tyler.

On many political questions of the day Webster seemed to vacillate, but, in perspective, he is seen to have been consistent to one principle. A free-trader, he became a protectionist on the ground, that since protection had been established, it must be maintained or business built up under it would be demoralized. Although opposed to the extension of slavery, he joined Clay in securing the passage of the Missouri Compromise. On the other hand he supported Jackson in the Force Bill which authorized the president to use the army and navy to enforce federal laws in any resisting state. The truth is that he hated nullifier and abolitionist alike, and fought every measure and every opinion which tended to divide North and South. He was concerned only with preserving the Union. As early as the great speech of 1830 he predicted civil war as the inevitable result of these sectional interests, but he helped to delay the conflict until the federal government was strong enough to meet the shock. In the meantime he sowed seeds of national patriotism broadcast by his impassioned eloquence and unanswerable logic of history. His uncompromising attitude on this question probably lost him the presidency, for abolitionist sentiment was sweeping over the north resistlessly, and must soon have swept him from the public arena where he had, for a generation, been a colossal figure. He died on Oct. 24, 1852, while serving as secretary of state under President Fillmore. Consult *Life* by E. P. Whipple and *Great Speeches* by Henry Cabot Lodge.

Webster, Noah, an American scholar, was born at Hartford, Conn., Oct. 16, 1758. He studied at Yale College and served in the militia under his father in the Revolutionary War. While a teacher at Goshen, N. Y., he published *Grammatical Institutes of the English Language*. He published books and lectured on political subjects, taught an academy at Philadelphia, practiced law at Hartford, edited a magazine and a newspaper, and wrote pamphlets on epidemic diseases, banking and international law. He was almost the first American to see the importance of Winthrop's *Journal* to the history of New England, editing and publishing it. He also was influential as a pamphleteer and a political publicist in the people's discussions of the federal constitution of the new nation. In 1807 he published a grammar and began his *American Dictionary of the English Language;* but decided to fit himself more perfectly for the work, and spent ten years in the study of the origin of the English language and its connection with other languages. Seven years were then spent on the dictionary, including a visit to Europe to consult books and scholars at Paris and at Cambridge. The dictionary was published in 1828 in two volumes in the United States, followed soon by an edition of 3,000 copies in England. It has long been a standard dictionary of the English language, and has passed through many editions and revisions. More than 300,000 copies have been sold yearly, and the income from the book still is about $25,000 a year. As celebrated as the dictionary is *Webster's Spelling-Book,* which was used for many years in every school in the land, and of which more than 70,000,000 copies have been sold. Webster also published a *History of the United States.* He was one of the founders of Amherst College and a member of the Massachusetts legislature while residing in Amherst, and of the Connecticut legislature when living at New Haven. He died on May 28, 1843.

Consult *Life* by Scudder in The American Men of Letters Series.

Webster, Pelatiah, justly called the father of the American constitution, was born in Connecticut in 1725 and died at Philadelphia in 1795. About 1755 he became a successful merchant of Philadelphia, obtaining ample leisure for study and writing. During the Revolution he was thoroughly loyal to the United States, and suffered severely in purse and person. The Continental Congress often consulted him on American currency, finance and resources. After the war he wrote much on finance and economics. Among his writings are *A Dissertation on the Political Union and Constitution of the Thirteen United States* (1783) and *Political Essays on Money* (1791). Madison afterwards mentioned the *Dissertation* as an early and able effort in directing popular thought toward a better form of government, and it contains every essential element of our federal constitution. See *The North American Review*, Aug. 16, 1907, for an eulogy of Webster. His *Essays* remain an authority on the finance of their time.

Wedg'wood, Josi'ah, an English potter, was born at Burslem in Staffordshire, on July 12, 1730. He learned his trade from his father, but was not satisfied with merely carrying it on in the old methods, but made effort toward improvement. He succeeded in producing a cream-colored porcelain which was known as Queen's ware. He extended his improvements also to the form and decoration of his pottery, copying from ancient models and employing Flaxman the sculptor to design for him. He thus raised the rude manufacture of pottery in England to a high position as an art. He built large factories near Burslem for the manufacture of the Wedgwood ware, invented by him in 1775, calling the village Etruria. His liberality and public spirit equaled his wealth, and he was known also as a writer on philosophical subjects. He died on Jan. 3, 1795. Consult *Life* by Meteyard.

Weed, Thur'low, an American journalist, was born at Cairo, N. Y., on Nov. 15, 1797. At ten he was a cabin-boy on a sloop on the Hudson River, and at 12 an apprentice in a printing-office at Catskill, N. Y. He served as a volunteer in the War of 1812. He established *The Agriculturist* in western New York, editing several other journals until he was selected as the editor of *The Albany Journal*, an organ of the Whig party. Here he became an acknowledged leader first of the Whig and then of the Republican party, and had great influence in securing the nominations of Harrison, Taylor and Scott. In 1865 he moved to New York City and became editor of the *New York Times* and afterwards of the *Commercial Advertiser*. He died at New York on Nov. 22, 1882.

Wee'vil, a common name for a number of beetles with long snouts, abundant in the United States, the *Curculios*. The name of weevil is applied also to beetles of the family *Bruchidæ*. Some of the weevils are among the most destructive insects. The plum-weevil, for example, often destroys a large part of that fruit. The female bores a hole in the fruit with her snout, and lays an egg in the cavity; the egg is then pushed to the bottom with the snout. The larva hatches and feeds upon the fruit, which spoils and drops off the tree. The same insect infests cherries, but the wormy cherries hold to the tree. It is also destructive to apricots and peaches. Fortunately, this species is not found on the Pacific coast. The acorn-weevil and the nut-weevil are destructive to acorns, hickory nuts and chestnuts, the snout being in all cases used to make a hole for the eggs. Apple and strawberry weevils attack those fruits, and the latter are especially destructive when they get into a strawberry patch. A large and very destructive member is the Mexican cotton-boll (*q. v.*) weevil, which worked such devastation in Texas a few years ago. The larva, a white maggot, lives on the inner tissue of bolls and buds. The adult weevils feed on tender twigs and leaves. Adults hibernate in rubbish. Remedies recommended are the fall-plowing and burning of infested fields, early planting and cultivation. Stored rice is infested by the rice-weevil, which does a great deal of damage. Peas and beans have been greatly harmed by the pea-weevil, the larva of which bores through the pod and into the pea, feeds industriously here, when full-grown eating a passageway on one side of the pea through which it is to make exit later; in the pea it undergoes transformation, and then emerges as an adult beetle. The larva in feeding avoids the germ of the future sprout, and many peas planted for seed are infested, beetles readily emerging from them. As a rule beetles begin to appear as soon as the peas are in bloom. Certain grain and flour insects are mistakenly called weevils.

Weim'ar (*vī'mär*), a town in Germany, capital of Saxe-Weimar, is 60 miles southwest of Leipsic. It is on Ilm River, in a pleasant valley, but, though a court residence, has little trade and no manufactures. It is celebrated as the home of Goethe, Schiller, Herder and Wieland. The ducal palace has rooms decorated with frescoes illustrating the works of these authors, the public library contains busts of them, and there are a double statue of Goethe and Schiller, one of Herder and one of Wieland; and the tomb of Herder is in the town-church. There are a gymnasium, a free school of design, a public library, a theater, once famous under Goethe's and Schiller's management, and a fine museum. Population 31,117.

Weir (*wēr*), **Robert Walter,** an American painter, was born at New Rochelle, N. Y., June 18, 1803. After studying in Italy for several years he was made professor of drawing at West Point, N. Y., where he remained for 42 years. His best-known works are *The Landing of Henry Hudson; Columbus before the Council of Salamanca; Indian Captives* in the Boston Athenæum; *Embarkation of the Pilgrims* in the rotunda at Washington; and *Christ in the Garden*. Some of his works in private collections at New York are very fine, as a *View of the Hudson from West Point; Rebecca* from *Ivanhoe;* and *A Pier at Venice*. He died at New York on May 1, 1889.

Weismann (*vīs'män*), **August,** a distinguished German zoölogist, was born at Frankfort-on-the-Main on Jan. 17, 1834, and studied medicine at Göttingen, Paris and Vienna. He early showed a decided fondness for natural science, being specially interested in biology. In 1873 he was appointed professor at Freiburg, and has since devoted himself enthusiastically to research. His writings embrace *Studies in the Theory of Descent, Germ Plasm, Essays on Heredity* and other works bearing on evolution.

Weld'ing, the process by which metals, as iron and platinum, and glass are, when in a fused, plastic, white-hot state, united by hammering and heavy pressing. Car-rails, when laid together, are spliced and clamped by cars going over them fitted with electric current and welding apparatus, after which they are submitted repeatedly to heavy pressure.

Wel'land Canal, one of the most important public works in North America, connects Lake Erie and Lake Ontario. It is 27 miles long. It crosses Welland (or Chippewa) River, a considerable stream, at Welland by an aqueduct built at great expense, the water of the river flowing through arches under the aqueduct. This empties into the Niagara at Chippewa, almost immediately above Niagara Falls.

Welland Canal was the project of William Hamilton Merritt, an enterprising man of affairs residing in St. Catharines, where he had mills. In 1818 he decided to take definite action towards carrying out the project he had conceived years before. Needing water for his mills, he aimed at getting communication with Welland River, and obtained a grant of £2,000 from the government for the cost of surveys. The first survey was inconclusive and unsatisfactory. In 1823 he formed a company with small capital, having decided to push on the work as a private enterprise, and sufficient capital to warrant the commencement of the work was obtained, mainly in New York, and in 1824 the first sod was turned. In 1829 the first two vessels, decorated with flags and cheered by a large gathering of people lining the banks, passed St. Catharines through the canal on their way to Lake Erie. In 1837 an Act of Parliament was passed for the purchase of canal-shares from the shareholders. The government assumed entire control of the canal in 1842 and inaugurated the great work of enlargement and improvement. The first enlargement was completed in 1845. In 1870 the government took steps to make practically a new canal, which would connect with the old one and, when enlarged, would admit the largest vessels navigating the great lakes. This has been finished, and now further deepening and enlargement are contemplated. At present vessels drawing 14 feet of water can pass through. Large ocean-vessels regularly pass through it to ports west. At Port Colborne on Lake Erie, where is the entrance to the canal, a large sum has been expended during the last two years in harbor-improvements and in the erection of an immense grain-elevator. There is a large lock at Port Colborne and no other until you reach Thorold, a distance of about 20 miles. Besides furnishing a great waterway for vessels from Lake Erie to Lake Ontario, the canal provides an inexhaustible supply of water for mills and manufacturing plants. Canada has spent nearly one hundred millions of dollars on her canals, and the end is not yet.

The total number of Canadian vessels which passed through Welland Canal in 1906 was 866 (617 steam, 249 sail); the total number of American vessels was 670 (602 steam, 68 sail). Through St. Lawrence canals in the same year passed 8,213 (4,051 steam) Canadian vessels and 1,258 (869 steam) American vessels. Through Ste. Marie Canal during 1906 the total number of Canadian vessels was 3,922 (3,469 steam) and 1,758 American vessels (1,599 steam).

Welland Canal (enlarged or new line) is 26¾ miles long; has two entrances from Lake Ontario at Port Dalhousie, one for the old, the other for the new canal. From Port Dalhousie to Allanburg, 11¾ miles, there are two distinct lines of canal in operation, the old line and the enlarged or new line. From Allanburg to Port Colborne, 15 miles there is only one channel, the old canal having been enlarged. The canal has two pairs of guard-gates and 26 locks. The locks are 270 feet by 45 feet, the depth of water on the sills being 14 feet. The total rise or lockage is 326¾ feet. The length of the vessels to be accommodated is 255 feet. From the head of Welland Canal there is deep-water navigation through Lake Erie, Detroit River, Lake St. Clair, St. Clair River, Lake Huron and Ste. Mary River to the Sault Canal, — about 580 miles. From the Sault the distance through Lake Superior to Port Arthur is 266 miles and to Duluth 400 miles. (See CORNWALL, LACHINE, MONTREAL, ST. LAWRENCE RIVER and SOULANGES.)

Welland, eight miles from Port Colborne on Lake Erie is on the canal. Its population exceeds 5,000, and it is growing rapidly.

The importance of Canadian waterways in controlling rates of transportation can be easily proved, and will become more apparent as the country west of Lake Superior develops. The returns show that traffic up and down has nearly trebled in 20 years. In the business westward there is a gain of 368 per cent., in that eastward one of 257 per cent. This expansion of business on the canals of Canada is relatively larger than that shown by Canadian railways during the same period. While 57,966,713 tons of freight were carried by Canadian railways in 1906 as compared with 16,356,337 in 1887, the increase was only 254 per cent. as against 287 per cent. on the canals. The trade between lake-ports of the United States by Canadian canals has grown largely since 1887.

Iron ore was the leading commodity making up the traffic through the canals during 1906. The wheat tonnage (46,801,367 bushels) amounted to 1,406,741, the flour tonnage 297,937 and the corn tonnage 244,122.

No tolls are now collected, the canals having been declared free. The quantity of wheat, corn, oats and other grains which arrived at Montreal, *via* the Grand Trunk and Canadian Pacific railways, in 1906 was 386,963 tons, and the quantity of the same articles which passed down the whole length of the St. Lawrence canals to Montreal the same year was 449,673 tons. The quantity of wheat lightered at Port Colborne in 1907 was 1,009,474 bushels. The total quantity of freight passing through the Welland canal in 1906 was 1,201,967 tons, of which 740,488 tons were agricultural products. There were 979,099 tons of freight passing eastwards and 222,868 passing westwards. Of the eastbound, through freight Canadian vessels carried 488,674 tons and American vessels 480,116 tons; of the westbound, through freight Canadian vessels carried 119,104 tons, and American vessels carried 102,886. On the St. Lawrence canals the total quantity of freight moved was 1,636,117 tons, of which 624,706 were agricultural products, and 595,566 merchandise.

Welland, a Canadian River which flows east 60 miles and empties into the Niagara. It was used as a part of Welland Canal, built to connect Lake Erie and Lake Ontario and to enable vessels to pass around Niagara Falls.

Well-Bor'ing, Drill'ing or **Sink'ing,** a familiar process, which dates from early historic times, for obtaining water. In modern days it is also used for mining purposes or in the search for salt, petroleum or natural gas. The sinking of shafts is also of frequent occurrence for ventilating mines or to obtain a good foundation on which to raise a superstructure of any kind. In the process of shaft or well-sinking a percussion or pounding drill is generally used. If the stratum which has to be cut through is hard rock, then the diamond-drill is employed. Machinery, driven by steampower, furnishes the means of operating the drill or other sinking-gear. The operation is facilitated by the erection of a derrick and its attached power-plant, drilling and hoisting machinery.

Welles (*wĕlz*), **Gĭd'eon,** American statesman was born at Glastonbury, Conn., on July 1, 1802. He for many years was editor and part proprietor of *The Hartford Times*. While a member of the Connecticut legislature, he secured the abolition of imprisonment for debt. He held a position in the navy department under President Polk, and was made secretary of the navy under President Lincoln, holding the position for eight years. He found the navy at the beginning of the Civil War without a single warship. Yet he succeeded in maintaining a blockade for over 2,000 miles of coast and formed a fleet of ironclads and transports on the Mississippi River. He died at Hartford, Conn., Feb. 11, 1878.

Wellesley (*wĕlz'lĭ*) **College,** an undenominational college founded at Wellesley, Mass., in 1875 for the higher education of women. It has a partly elective course admitting to the degrees of B.A. and M.A., students being admitted either by examination or on certificate from accredited junior schools. The institution offers about 50 undergraduate and 30 graduate scholarships, with studentship in the American schools of classical studies in Athens and Rome and scholarships in the marine biological laboratory at Woods Holl, Mass., and in the zoological station at Naples (*q. v.*). It now has 1,500 students, a faculty of 142 instructors and a library of 83,096 volumes. It has an income of over $400,000, with a considerable endowment, besides property and grounds valued at $4,000,000.

Wellesley, Mass., a town in Massachusetts, 14 miles west of Boston, where is situated Wellesley College. It is in Norfolk County and on the Boston and Albany Railroad. Here also are Assumption and St. Joseph Academies (R. C.), Dana and Rock Ridge Halls and Wellesley School. The town owns and operates its waterworks. Population 5,413.

Wellesley, Richard Colley, Marquis of, a British statesman, brother of the duke of Wellington, was born at Dublin, June 20, 1760. He studied at Eton and Oxford, took his seat in the Irish house of peers, and was one of the original Knights of St. Patrick when the order was formed in 1783

In 1784 he obtained a seat in the British house of commons, and in 1797 entered the house of lords as Baron Wellesley. He was sent to India in 1798 as governor-general, where he found the British possessions threatened by the French in alliance with Tippoo Sahib (*q. v.*), a powerful native prince. He secured the French officers who were over the native troops, sent them out of the country, and defeated Tippoo Sahib, who was slain in battle. He effected a treaty with Persia, and carried on successfully the Mahratta War, which ended by making England the great power in India, adding 40 million people and $50,000,000 of revenue to her kingdom. He built the palace of Calcutta, founded the College of Fort William, and introduced financial reforms that doubled the revenues of the East India Company. The great expense of his administration and charges of cruelty to native princes were the complaints made against him, and articles of impeachment were presented but rejected by the house of commons. He was ambassador to Spain, secretary of state, lord lieutenant of Ireland and lord chamberlain. He had an annuity of $25,000 from the East India Company and a gift of $100,000 toward the close of his life. He died at London, Sept. 26, 1842.

Wel'lington, Arthur Wellesley, Duke of, one of England's greatest generals, was born at Dungan Castle, Ireland, May 1, 1769. He studied in a military college in France. His first actual service was in command of a regiment in the Netherlands in 1794. While his brother was governor of India, he won his first fame in the Mahratta War with the brilliant victory of Assaye, gained with 4,500 men against 40,000 Mahratta troops. After serving in Hannover and Denmark and commanding an expedition sent to Portugal, he was put in command of the peninsular army in Portugal and Spain, which was opposed to the veteran forces of Soult and Victor. He won the battle of Talavera (July 27-28, 1809), for which he was created a peer and given a pension of $10,000. He carried the war into Spain, which was held by the French, gained the battles of Badajos and Salamanca, and was made general-in-chief of the Spanish armies, as he had already been of the Portuguese forces. His pension was doubled, and $500,000 given him to purchase lands. He followed the retreating army into France, took Pamplona, and defeated Soult under the walls of Toulouse. He received for the twelfth time the thanks of Parliament and, also, a gift of $2,000,000. When Napoleon escaped from Elba, Wellington was put in command of the British forces, while the Prussian army was led by Blücher. On June 18, 1815, came the great battle of Waterloo, which finally crushed the power of Napoleon. The allied armies marched upon Paris, and Louis XVIII entered the city the day after the English army. Wellington took command of the army of occupation, living in Paris for three years, where two attempts were made upon his life. He was created field-marshal of the armies of Russia, Prussia and Austria, and prince of Waterloo by the king of the Netherlands, while Parliament added $1,000,000 to its former gift. He represented Great Britain at the congress of Vienna, was sent on an embassy to Russia, and became commander-in-chief of the British army. His political career, during which he filled the first positions in the country, lost him much of his great popularity, as he took a firm stand against reform, his opposition to the reform bill being followed by an attack of a London mob on his house, and hooting and pelting in the streets. His share in the repeal of the corn laws restored the Iron Duke, as the people loved to call him, to popularity. He died at Walmer Castle, Kent, Sept. 14, 1852. Consult *Lives* by Browne, Gleig, Maxwell and Yonge and his own *Dispatches and Memoranda.*

Wellington, New Zealand, a provincial district in, and the seat of the government of, the newly formed Dominion in the southern Pacific. It is situated in the southern part of North Island, the city being on Cook Strait, which separates North and South Islands. It has a fine harbor on an inlet of the strait, and has a large shipping-trade, chiefly exporting wool, frozen meat, *kauri* gum, butter, cheese and gold. The value of the total trade in 1910 was £9,156,634. The area of Wellington District is 11,003 square miles, with a population in 1911 of 199,094, exclusive of the native Maoris; in the same year the city had a population of 64,372 or, with suburbs, 70,729. In the city, besides the Houses of Parliament, Government House and public buildings, are the general post-office, the life-insurance offices, those of the harbor-board, churches, schools and a number of attractive stores. Its industries include potteries, foundries, soap and candle and freezing works, woolen mills, a wax-match factory, several boot and shoe factories and a rope-works.

Wells College. This college for women has accommodation for about two hundred students. Only candidates for the degree of Bachelor or Master of Arts are received. It was founded at Aurora, N. Y. by Henry Wells in 1868. It is undenominational. It has 195 students, 34 instructors, and 25,160 volumes in the library. The productive funds amount to about $350,000 and the total income is about $140,000.

Wells, David Ames, an American economist of note, free trader, lecturer and writer on economics and political science, was born at Springfield, Mass., June 17, 1828, and died at Norwich, Conn., Nov. 5, 1898. After graduating at Williams College and at Lawrence Scientific School, Harvard, he for a time was associate-editor of *The Springfield Republican*, and took a hearty interest in the publication for a series of years of *The Annual of Scientific Discovery*. In 1866 he was appointed United States commissioner of revenue; in 1877 was chairman of a commission to report upon the laws relating to taxation in the state of New York; and generally took a prominent part in discussions of the time on financial and economic subjects. He was an industrious and prolific writer. Among his published works are textbooks on *Familiar Science, Science of Common Things, Elements of Natural Philosophy, First Principles of Geology, Production and Distribution of Wealth, Practical Economics, The Relation of the Tariff to Wages, Recent Economic Changes* and *The Principles of Taxation*. He also published *Robinson Crusoe's Money* and *Our Merchant-Marine*.

Wells'ton, Ohio, a city in Jackson County, on the Baltimore and Ohio Southwestern, Cincinnati, Hamilton and Dayton, Detroit Southern and Hocking Valley railroads, about 75 miles south-southeast of Columbus. Settled about 1871, it was incorporated in 1876. Besides its public buildings it has a fine park (Lake Alma), and is the seat of Hoy Hospital. It is in a coal and iron mining region, its chief industries (besides the manufacture of cement) being a foundry, barrel-factory and blast-furnaces. The city owns its waterworks and its electric-light plant. Population 6,875.

We'ner or **Vener, Lake.** See SWEDEN.

Weser (*vā'zẽr*), one of the chief rivers of Germany, flows through Prussia and empties into the North Sea. It is 260 miles long, but of little use for navigation.

Wes'ley, Charles, was born at Epworth, in Lincolnshire, England, Dec. 18, 1708. The name is thought to be the same as Wellesley, and Garrett Wellesley offered to make Charles Wesley his heir if he would settle in Ireland, but the offer was declined, and the estate went to another branch of the family, from which came Arthur Wellesley, Duke of Wellington. Charles Wesley, after studying at Oxford, went to Georgia with his brother John. On his return to England he took an active part in the work of forming the Methodist church. He is especially known as a hymn-writer, some of the most beautiful hymns in collections of hymns being his work. *Jesus, Thy Robe of Righteousness* and *Blow Ye the Trumpet, Blow* are among the best known of his large contributions to the music of the church, which numbered 4,100 published hymns and 2,000 in manuscript. He died at London, March 29, 1788. Consult *Life* by Jackson and that by Telford and Julian's *Dictionary of Hymnology*.

Wesley, John, the founder of Methodism, was born at Epworth, in Lincolnshire, England, June 17, 1703. He was made a fellow in Lincoln College, Oxford, where, with his brother Charles and a few others, he began a systematic course of religious exercises that gave them the name of Methodists. In 1735 he went to Georgia as preacher to the colonists and missionary to the Indians, and became impressed with the views of the Moravians who were his fellow-passengers at sea. After two years he returned to England. Here he studied the Moravian doctrines, and ascribed his conversion to a Moravian meeting in London. He began his preaching in London, and soon joined George Whitefield in open-air services, sometimes delivering 800 sermons a year. The meetings were attended by thousands, especially in the mining and manufacturing districts. Persecution and opposition resulted in Wesley's forming bands for prayer and a church-society and, finally, in his ordaining preachers to be sent to America, Scotland and other places, thus separating entirely from the Church of England. He traveled nearly 270,000 miles, usually on horseback, and preached over 40,000 sermons, He wrote a large number of volumes on religious subjects, and with Charles, his brother, published a collection of hymns. He died at London, March 2, 1791. See *Lives* by Southey, Watson and Moore and *History of the Religious Movement of the 18th Century* by Stevens.

Wes'leyan Univer'sity, at Middletown, Conn., was founded in 1831, and is the oldest of the colleges established under the auspices of the Methodist Episcopal church in the United States. It has 43 instructors, 480 students and a library of 102,000 volumes. Benefactions in 1914 were 116,000; income $185,639; and productive funds $2,421,497.

West Bay City. See BAY CITY.

West, Benjamin, an American painter, was born at Springfield, Pa., Oct. 10, 1738. His first portrait was a picture of his baby sister, smiling in her sleep, made when he was only seven. His colors were made from berries, and his brush was of hairs stolen from the cat's tail. His first work was done at Philadelphia and New York, but in 1760 he went to Italy for further study, and after three years of training settled in London. Here he became famous at once, and was appointed historical painter by George III. He was one of the four artists who formed the Royal Academy, and was chosen to succeed Sir Joshua Reynolds as its president. His paintings mostly were on historical and religious subjects, on a large scale, in imitation of the old masters. The *Death of Wolfe*, the *Battle of*

La Hogue and *Christ Healing the Sick* are among his best paintings, of which he left nearly 400. He died in 1820, and was buried in St. Paul's, London. Consult Cunningham's *Lives of Eminent Painters* and Redgrave's *Century of Painters of the English School*.

West Ches'ter, Pa., a borough, the seat of Chester County, on the Pennsylvania and Philadelphia, Baltimore and Washington railways, 24 miles west of Philadelphia. It was settled, incorporated as a town, and later became a borough, about the close of the 18th century. Its institutions (besides the county court-house, jail and municipal buildings) embrace Chester County Hospital, State Normal School, seminaries, schools, churches and a public library, in addition to two attractive parks. Near by is the battlefield of the Brandywine (*q. v.*), and the region is noted for its market gardening and dairying interests. Its industries include dairying implements, cream-separators, planing-mills, machine-shops, a tag-factory, grain-elevators and wheel-works. Population 11,767.

West'cott, Brooke Foss, an English prelate, writer and biblical scholar, was born near Birmingham in 1825, and educated at Trinity College, Cambridge. He successively was a master at Harrow, canon of Peterborough, regius professor of divinity at Cambridge and canon of Westminster, and in 1890 was appointed bishop of Durham. He interested himself in the miners there, gained their trust, and settled and prevented difficulties between them and the mine-owners. He stood well up among scholars and theologians. With F. A. Hort he spent 28 years in ascertaining the true text of the Greek New Testament. Their text is considered authoritative and almost final, and forms the basis of the revised version in English, of which also he was one of the makers (1874-81). He is one of the glories of the church universal. His writings are numerous, embracing a *History of the Canon of the New Testament, Introduction to the Study of the Gospels, History of the English Bible, The Gospel of the Resurrection, The Gospel of Life, Social Aspects of Christianity, The Historic Faith, The Revelation of the Risen Lord* and *Characteristics of the Gospel Miracles*. He died on July 27, 1901.

West'erly, R. I., a town embracing a group of villages in Washington County on Pawcatuck River and the New York, New Haven and Hartford Railroad, 42 miles southwest of Providence. Settled and incorporated in the latter half of the 17th century, it has become the center of farming interests, manufacturing and considerable granite-quarrying. Its manufactures embrace printing-presses, woolen and cotton goods and thread. Wilcox Park is an attaractive local resort, as is also Watch Hill in summer, where there is good bathing on the shore of Long Island Sound. Population 8,696.

Western, The, a college for women located at Oxford, O., was established in 1853, as The Western Female Seminary. In 1894 the name was changed to The Western, a college and seminary for women. It has 27 instructors, 245 students and a library of 13,143 volumes. See Oxford, O.

Western Austral'ia forms about a third of Australia (*q. v.*), and is 1,400 miles long and 850 broad, covering 975,920 square miles, with a coast of 3,500 miles. The Murray, Blackstone, Swan and Murchison, 400 miles long, the Fitzroy and the Ord are some of the principal rivers. The country is mostly level, covered with forests, with a dry, sandy region in the interior and a few, shallow, salt lakes. The Darling, Victoria and Herschel are the principal mountain-ranges — not over 3,000 feet high. The eucalyptus, mahogany, red gum, York gum, jarrah, baobab, sandal-wood, grass-tree, paper-bark tree and mangrove are some of the peculiar trees, while the kangaroo, wombat, wallaby and dingo or wild dog are found among the animals. The raising of sheep, goats and cattle is the most important industry; the fisheries, including turtle, rock-cod and snapper, provide material for the canneries; and the pearl-fisheries are increasing in value; salt, raisins, castor-oil, honey, wax, manna, gums and wine are other products. Gold is found in Kimberley; magnetic iron ore at Mt. Magnet; lead and copper in the Victoria region, besides silver and plumbago. In 1906-7 the government expended £169,753 on its schools. There were 376 public schools, with 28,927 pupils in attendance and 108 private schools with 7,515 pupils. There were 1,990 miles of railway and 10,000 miles of telegraph. Western Australia is a British state, first settled by a convict-colony at Port Jackson, but it made little growth until convict-labor was introduced. From 1850 to 1868, 10,000 convicts were brought into the country. The capital is Perth (population 50,527). Population of the state 184,124.

West'field, Mass., a town, consisting of a group of early settled villages, in Hampden County, on Westfield River and on the Boston and Albany and New York, New Haven and Hartford railroads, nine miles west of Springfield. Its institutions include a state normal school, Noble Hospital and Westfield Athenæum. The town owns and operates its own waterworks, gas and electric-light plant, and has an attractive resort in Woronoco Park. Its industries embrace the manufacture of bicycles, radiators, boilers, cigars, driving-whips, organs, thread and boxes. It also has paper-mills, brick-yards and machine-shops. Population, 16,044.

West Ho'boken, N. J., a flourishing town in Hudson County, N. J., on the Hudson River, adjacent to New York City. It is largely engaged in the manufacture of silk-goods. It has schools, churches and civic buildings, a convent of the Sisters of St. Dominic, a Roman Catholic school and a monastery of the Passionist Fathers. The population has more than doubled in the past decade, its inhabitants now numbering 35,403.

West In'dies, an archipelago of about 1,000 islands lying between North and South America. The island of Guanahani was the first land seen by Columbus, and he gave the name of West Indies to the region, thinking he had found a new route to India. The islands separate the Atlantic Ocean from the Gulf of Mexico, and are in four groups: the Bahamas; the Greater Antilles, including Cuba, Haiti, Jamaica and Porto Rico; the Lesser Antilles; and the islands off the coast of Venezuela. The Bahamas are low islands of coral, while the other Antilles are mountainous and volcanic, having peaks from 6,000 to 8,000 feet high. The summers are very hot, and hurricanes are numerous and severe. Insects, snakes, lizards and scorpions abound, and the birds are especially beautiful. The forests produce mahogany, satinwood, crabwood, rosewood and other valuable lumber. Ginger, pepper, pimento, aloes, sassafras, cochineal and indigo are other products. The chief trade is in sugar and tobacco. The mineral wealth is not great, though gold, silver, iron, copper, tin, lead, salt and other minerals are found and worked to some degree. The Spaniards began their dominion over the islands by enslaving the native tribes they found there, who at times revolted against their masters, but with no effect, and were almost exterminated. As a result of the Spanish-American war in 1898 Porto Rico was ceded to the United States and Cuba was freed from Spanish sovereignty. Guadaloupe, St. Bartholomew and Martinique belong to France; the Bahamas, Jamaica, the Leeward and the Windward Islands and Trinidad to England; some of the smaller islands to the Dutch. The "Danish West Indies" now belong to the United States. Haiti is independent. Population (total) 5,678,128.

Wes'tinghouse', George, American engineer and inventor of the air-brake, was born at Central Bridge in Schoharie County, N. Y., on Oct. 6, 1846, and spent his early youth as apprentice in his father's machine-shops at Schenectady, where he was also educated in the public schools of the town. In the Civil War he served for two or three years with the 12th New York Regiment and the New York Cavalry Corps, and later became assistant-engineer in the United States navy. Returning to Schenectady in 1865, he resumed his education at Union College, meanwhile pursuing his bent towards mechanical investigation. The result was his invention of the locomotive air-brake, which came into instant use in this country and, later, in Europe. For this and for his other useful mechanical devices and patents he received honors abroad. He also devoted himself to electrical research and made such discoveries or developments of discoveries as to make possible the long-distance transmission of power. Connecting himself with a large manufacturing plant at Pittsburgh, Pa., he gave practical effect on a large scale to his inventions and mechanical appliances, turning out steam and gas engines, steam turbines etc., and also supplying the generators for use in the large power-plants at Niagara Falls and those in use by the rapid transit and elevator systems of New York and elsewhere. He died March 12, 1914.

West'minster Abbey is in the city of Westminster, which now is a part of London. On an island formed by a branch of the Thames, Sebert, king of the East Saxons, built a church in the 7th century, which was replaced, it is thought, by an abbey called Westminster, to distinguish it from St. Paul's or Eastminster. The first building of stone on the site was built by Edward the Confessor, of which the pyx-house is a remnant. The present abbey was mostly built by Henry III, beginning in 1220 with a chapel. The western front with its great window was the work of Richard III and Henry VII, who also built the chapel called by his name. Two towers were added by Sir Christopher Wren. The building is a cross, 511 feet long. It was used as the burying-place of the English kings, and is crowded with monuments. The shrine of Edward the Confessor was built by Henry III; the tombs of Edward I, Henry III, Henry V, Edward III and of most of the sovereigns from Henry VII to George III are within the walls. There are, besides, the two coronation-chairs, one inclosing the stone brought by Edward I from Scone, on which the Scottish kings were crowned. The most interesting part of the abbey is the Poets' Corner in the eastern aisle of the southern transept, where are memorials of the great British poets, Chaucer, Dryden, Milton, Gray, Shakespeare, Addison, Thomson, Tennyson and the American poet, Longfellow. The monuments of Pitt, Fox, Chatham, Canning and Wilberforce and of the great inventors, Talford, Watt and Stephenson are in other parts of the building. Consult Walcott's *Memorials of Westminster*.

Westminister, Can. One of the richest agricultural districts of British Columbia is New Westminister, which includes all the fertile valley of the lower Fraser. The climate is mild, with much rain in winter. The timber is heavy, the underbrush thick.

Westminister is the center of the great lumbering and salmon-canning industries. Its agricultural advantages are unexcelled in the province, heavy crops of grain, hay and roots being the rule, and fruit growing to perfection and in profusion. A great deal of the land in Fraser Valley has been reclaimed by dyking.

Westpha'lia, a province in western Prussia, bordering on Holland. It is 110 miles long and 124 wide, covering 7,803 square miles. The Lippe, Ruhr, Ems and Weser are the principal rivers, the Weser crossing Weser Hills by a pass called the Westphalian Gate. The Lippe divides the country into two parts, the northern portion flat like Holland and the southern portion having hills and valleys. The farming is carried on by small farmers with old methods, the most important crops being hemp and flax. Cattle, goats and hogs are raised, the latter yielding the well-known Westphalian hams. Mineral resources give great prosperity. There are large coal-fields in the north, and it produces more iron-ore than any other province of Prussia except Silesia. It also is rich in copper, zinc, sulphur and salt. The leading manufactures are linen-weaving and iron-working. Westphalia was the name of the western part of the duchy of Saxony. It was divided when Henry the Lion's Saxon domains were distributed by Emperor Maximilian, the archbishops of Cologne receiving a part, with the title of dukes of Westphalia. Napoleon formed the kingdom of Westphalia for Jerome, his brother, which was abolished after the battle of Leipsic. The congress of Vienna (1815) finally gave Westphalia to Prussia. The peace of Westphalia at Osnabrück and Münster, in 1648, ended the Thirty Years' War. Population 3,618,090.

West Point, N. Y., the seat of the United States Military Academy, is a village of Orange County on Hudson River, 52 miles north of New York City. It is a promontory about 180 feet above the river, commanding the fine scenery of the Highlands and surrounded by hills reaching from 500 to 1,500 feet in height. The military school was founded in 1802, and provides free education for 300 cadets, who are bound to serve in the army (*q. v.*) for eight years. Each congressional district can send one cadet and ten are appointed by the president. The course of training lasts four years, and the graduates have the rank of second lieutenant in the regular army. The buildings include several batteries, besides the library, stone barracks and buildings for instruction, and contain many war relics and portraits of military heroes. West Point was guarded during the Revolutionary War by two forts and a chain across the river, which were taken by the British in 1777, but abandoned by them after Burgoyne's surrender. The point was afterwards strengthened by forts and other works, which Benedict Arnold, the commander, was bargaining to betray to the British, when the arrest of Major André (*q. v.*) defeated the plot. See MILITARY SCHOOLS.

West Spring'field, Mass., a town consisting of a cluster of villages on Connecticut River, in Hampden County, opposite Springfield and on the Boston and Albany Railroad. Settled about the middle of the 17th century as part of Springfield, it was separately incorporated in 1774, and has become an attractive place of residence for the people of Springfield. It owns its own waterworks, and here are the repair-shops of the Boston and Maine Railroad; here also is a well-equipped public library, besides good schools and churches. Its industries include the manufacture of paper, gas tanks and pumps. Population, 11,342.

West Virgin'ia, one of the central states of the Union, lies mostly between Virginia and Ohio River, with the narrow strip, called the Panhandle, running for 60 miles between Ohio and Pennsylvania.

Area and Surface. It covers 24,645 square miles, nearly all of it being mountainous or hilly, which has given it the name of the Switzerland of America. The Alleghany Mountains are on the eastern border, and in the western part of the state are Laurel Hill, Greenbrier, Gauley and Rich Mountains, a continuation of the Cumberland range. The Potomac forms 100 miles of the northern boundary and the Ohio 300 miles of the western border, with the Monongahela, Great and Little Kanawhas and the Big Sandy flowing into it. The Kanawha is 450 miles long and is navigable for 100 miles. Nearly all the lower hill-country can be cultivated, and in the mountainous regions are broad, fertile valleys.

Resources. There still are a few large tracts of timber, though these are rapidly disappearing by reason of the extensive production of lumber and numerous wood-working industries. The coal-fields cover 16,000 square miles, a larger extent of country than Great Britain's and give the state the fourth place in the coal-states, while it is second in producing coal and coke. Petroleum, natural gas, iron-ore, salt, bromine, sandstone, marble, alum and copper are other minerals found very abundantly. The mineral springs, as Greenbrier, White Sulphur Springs (used by the Shawnee Indians and early white settlers), Berkeley Springs, Red Sulphur Springs, Old Sweet and Capon Springs, are famous summer-resorts. Corn is the largest crop, followed by wheat, oats and tobacco. The raising of horses, sheep and cattle is a large industry; the great lumber business, with tanneries and wood-pulp mills in connection with it, and coal-mining are other industries. The manufactures are those of leather, iron, steel, glass and pottery.

Education. There are 6,674 school-buildings in the state. The elementary schools have 8,782 teachers and an enrollment of 276,258 pupils. The *per capita* expenditure for their education is $23.92. The state supports a university with 14 different schools and colleges, six normal schools, two preparatory schools for the state's university, a school for the deaf and the blind, a reform school for boys and an industrial school for girls. There are about 30 colleges and academies under church and private control. The most important are Bethany College, founded by Alexander Campbell, organizer of the Disciples of Christ; West Virginia Wesleyan College, a coëducational institution founded by West Virginia Conference of the Methodist Episcopal Church; Morris-Harvey College, founded by the Methodist Episcopal Church South; and Davis and Elkins College, an institution under the control of Winchester Presbytery of the Presbyterian Church South.

History. The first permanent settlers in West Virginia came from east of the Alleghanies, and one of the first landowners was George Washington, who held 32,000 acres in the Ohio and Kanawha valleys. When Virginia seceded, the western part, separated from the eastern part by the Alleghany Mountains and closely connected with Ohio, refused to join the movement, held conventions at Clarksburg and Wheeling, and formed West Virginia, which was admitted into the Union in 1863. John Brown's raid on Harper's Ferry and the battles of Philippi, Beverly, Rich Mountain, Cheat Mountain and Carnifex Ferry were the chief actions on the soil of West Virginia connected with the Civil War. The chief city is Wheeling (population 41,641). The population of the state is 1,399,320.

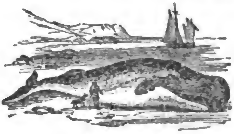
West Virginia Univer'sity, located at Morgantown, was founded in 1867 as West Virginia Agricultural College. In 1868, by act of legislature, the name was changed to West Virginia University. The organization includes colleges of art and sciences, engineering and mechanic arts, agriculture, school of music and commercial and preparatory schools. The faculty numbers 101, the students 1,651 and the library 25,000 volumes. In 1914-15 the income was $410,464.06.

Wet'terhorn, a lofty mountain in Switzerland, about ten miles from Lake Brienz. It rises almost perpendicularly in one great wall of limestone, 12,200 or 14,105 feet, according to different measurements.

Wey'man, Stanley John, English novelist, was born at Ludlow, Shropshire on Aug. 7, 1855, and educated at Shrewsbury School and Christ Church, Oxford. Studying law, he was called to the bar and practiced on circuit from 1881 to 1889, when his first work, *The House of the Wolf* — a romance of French history — appeared. After this his health necessitated travel abroad, and he abandoned law altogether. His more notable novels include *The New Rector, The Story of Francis Cludde* and *A Gentleman of France.* The success of the latter, which was published in 1893 and at once translated into many European languages, was immediate, and it has proved one of the most successful of recent historical romances. His later stories are *Under the Red Robe, My Lady Rotha, The Red Cockade, The Man in Black, The Castle Inn, The Long Night, Stane Crow Farm, The Abbess of Vlaye, In King's Byways, Shrewsbury* and the *Memoirs of a Minister of France.* He is a vivid and picturesque writer, and has been most successful in his treatment of themes drawn chiefly from the era of medieval France.

Wey'mouth, Mass., a town embracing a number of villages with an early historic interest, in Norfolk County, on Weymouth Fore River and the New York, New Haven and Hartford Railroad, 12 miles southeast of Boston. The town dates from the era of the Plymouth colonists, when it was known by its Indian name of Wessagusset. Its industrial interests are connected with the manufacture of shoes, with wool-scouring and with nail, coal and lumber works. It has two local libraries, the Tuff and the Fogg, besides churches, elementary and high schools, several banks and a weekly newspaper. Population 12,895.

Whale, a marine mammal of fish-like form belonging to the order *Cetacea.* The dolphins are included with the whales. Few people realize what the term, a marine mammal, means as applied to whales, the fish-like form suggesting an affinity with fishes; but they are warm-blooded animals, breathing by lungs and suckling their young with milk — in short, ranking above reptiles and birds and in the class of *Mammalia.*



SPERM-WHALE

There are two divisions, those with teeth, as the dolphin and the sperm-whale, and those without teeth in the adult but with plates of whalebone inside the mouth. The latter group, often called the true whales, have teeth in embryonic stages, and the fact that teeth arise and disappear before birth is taken to mean that the whalebone whales are descended from ancestors which had teeth and that the embryonic teeth are a matter of inheritance, but in the changed habits of the animal are not required. The whales have nostrils on the top of the head, and in coming to the surface they spout or blow. They do not, however, as is generally supposed, throw out a jet of water. The column of spray is due to the condensing of their warm breath, which is laden with watery vapor. The head, which in some species may make one third the length of the entire animal, merges into the body without a perceptible neck. The fore limbs are modified into paddles, but, internally, they show bones corresponding to those in the arm of man, not to those in the fins of fishes. The hind limbs are absent, but there is a distinct trace of the hip-bones. The tail is expanded horizontally, not vertically as in the fishes. Most warm-blooded animals are kept warm by a hairy covering; the whales, however, are almost destitute of hair; but the body is surrounded by a very thick layer of fat or blubber under the skin to keep up the temperature. The whales wander over a wide part of the ocean, being found in tropical, temperate and frigid seas. Their food is varied, that of the sperm-whales being partly made of large cuttlefish. The ambergris of commerce is derived from an internal secretion coming from these whales and containing the hard beaks of cuttlefish. The large whalebone whales feed on small crustacea, squids, fish and the like. They swim with their mouths open. When a number of these small creatures are collected within the mouth, it is closed and the water is strained through the plates of whalebones, while the animals are retained.

The rorquals, from 65 to 75 feet long, are among the most abundant whales. The finback whale, about 60 feet long, is found along the coast of the eastern United States and is sometimes seen in Massachusetts Bay. Another common whale of our eastern Atlantic coast is the black or right whale, about 40 feet long. It is occasionally found as far south as South Carolina. In the Arctic region is found the great bowhead, the most valuable of whales to the whale hunters, but not the largest one. It reaches a length of 50 to 60 feet, but an adult will yield from 200 to 300 barrels of oil and two tons of whalebone. The largest whale is the sulphur bottom of the Pacific, which reaches 100 feet in length, and is the largest of living animals and, probably, of all animals that have ever lived. The razorback of the northern Atlantic grows to be 70 feet in length. The sperm-whale or cachalot is a toothed whale, which attains a length of 80 feet. It inhabits the open sea, especially in southern latitudes. It yields the fine sperm-oil and spermaceti. The chase of these monsters of the ocean has greatly declined, largely on account of their growing scarcity and the abundance of other oils. Formerly New Bedford and San Francisco were the principal whaling-ports of the United States.

Whaleback Boats. This form of steam-vessel was developed on the great lakes of America between 1875 and 1880. The idea was to build a vessel of steel with top-sides and erections rounded in such form as to reduce the resistance both to wind and water to a minimum. The name was given because of the resemblance of that portion of the vessel which is visible when afloat to the back of a whale. The first whaleback barge was built of 437 tons' registry, 1,400 tons' capacity. Whalebacks are in use on the Atlantic coast. The *Chas. W. Whitmore*, 3,000 tons, made the voyage to Liverpool in 1891. The shape of these vessels makes them particularly steady at sea. The poor accommodation for the crew on long voyages has prevented its general adoption in traffic on the ocean.

Whate'ly, Richard, a British theologian, was born at London, Feb. 1, 1787. He studied at Oxford with honor, and remained there as tutor and afterward as Bampton lecturer. After having charge of a parish for two years, he returned to Oxford as principal of St. Alban's Hall, and later was made professor of political economy. His appointment soon after as archbishop of Dublin, "a call to the helm of a crazy ship in a storm" as he called it, gave him work of a different kind, but he endowed the chair of political economy in Trinity College. During the Irish famine he was unwearied in his efforts to help his people, and his charities always were on a large scale. His treatises on *Logic*, *Rhetoric* and *Christian Evidences*, his best-known works, were long used as textbooks. His *Historic Doubts Relative to Napoleon* is also famous. A daughter of his did noble service as a missionary among the Muslim women of Egypt. He died on Oct. 8, 1863. Consult *Life and Correspondence* by his daughter and *Memoirs* by W. J. Fitzpatrick.

Wheat, a species of *Triticum* (*T. sativum*), a genus of the grass family. It is not known in the wild state, but its original home is believed to have been in western Asia. It has been under cultivation throughout the entire time covered by human records. Spelt is a kind of wheat cultivated in some parts of Europe, in which the chaff adheres firmly to the grain, as in barley. In the wheat of ordinary cultivation, however, the chaff is easily removed by threshing. The numerous varieties are variously known as spring and winter wheat, bearded and beardless wheat etc. Spring wheat is sown in early spring; winter wheat in the autumn. Wheat is one of the most valuable of cereals, and is the source of all the common white flour of the United States. In 1910 the wheat crop of the world amounted to 3,667,494,000 bushels, that of the United States being over 695,443,000 bushels. In the same year the seven states showing the largest yield were Minnesota (94,080,000); Kansas (62,068,000); South Dakota (46,720,000); Indiana (40,981,000); Nebraska (39,515,000); North Dakota (36,105,000); and Illinois (31,500,000).

Wheat'stone, Sir Charles, an English inventor and scholar, was born at Gloucester in February, 1802. He began making musical instruments, and made many experiments in sound, inventing an instrument that was played by a piano in another room and so seemed to play itself. His first paper was *New Experiments in Sound*. He extended his studies to light and electricity, invented a number of instruments, and with Cooke took out a patent for an electric telegraph in 1837. He invented the stereoscope, the cryptograph and a telegraphic barometer and thermometer, by which an observer at the foot of a mountain could read the instruments at the top. Scarcely a year passed without a paper from him on some difficult scientific subject or without an invention. He was made professor in King's College, London, a fellow of the Royal Society, a member of all the leading foreign scientific associations, and, after the completion of his automatic telegraph, was knighted. He died at Paris, while perfecting an instrument for submarine cables, Oct. 19, 1875.

Wheatstone's Bridge, a piece of electrical apparatus devised by Sir Charles Wheatstone for measuring the electrical resistance of a conductor. It consists of a network of six wires arranged as shown in the accompanying diagram. Four resistances: R, R_1, R_2 and X, are so joined in series as to form a closed circuit. In this circuit there will always be four junctions, namely, A, D, B and F. The next step in manufacturing a Wheatstone's bridge is to join a battery across two diagonally opposite junctions, say A and B, as shown in the diagram. The current entering at A divides into two parts, one flowing along the branches X and R_1, the other flowing along the branches R and R_2.

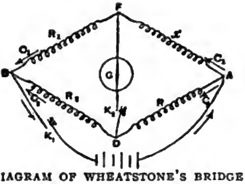


DIAGRAM OF WHEATSTONE'S BRIDGE

Next join the remaining two junctions, F and D, by a circuit containing a galvanometer. In general, the potential at F and the potential at D will be different; but by diminishing the resistance in R and increasing the resistance in R_2, or *vice versa*, we can easily make the potentials at F and D the same. When this adjustment is reached, there will be no current flowing through the galvanometer G, even if the key K_2 be closed. Let us now call the fall in potential between A and F (and hence also between A and D) E_1; and the fall in potential between F and B we shall denote by E_2. Then, by Ohm's law, we may write

$$\frac{E_1}{X} = \frac{E_2}{R_1} \text{ and } \frac{E_1}{R} = \frac{E_2}{R_2}.$$

Dividing one of these equations by the other, we have

$$X = \left(\frac{R_1}{R_2}\right)R.$$

Accordingly, if we know the value of one resistance R and the ratio of the other two, R_1 and R_2, we can at once obtain the value of the unknown resistance X. This is the purpose of the Wheatstone bridge. Consult any good textbook of physics for a discussion of this subject.

Wheel, a piece of wood or metal, usually round and either solid or open, fastened to a center piece, around which it turns. The center-piece is called an axle when the wheel turns on it, and an arbor or shaft when the wheel turns with it. Wheels are used to produce motion and are of different kinds, as wagon-wheels, water-wheels, car-wheels, steamboat-wheels, fly-wheels, balance-wheels, crown-wheels, spur-wheels, band- or belt-wheels, ratchet-wheels, cog-wheels and pinions, the kinds used in machinery. Carriage and wagon wheels are made of wood with a band of iron; car-wheels and machinery-wheels of iron, though sometimes of wood or brass; and clock and watch wheels of brass also. Carriage and wagon wheels are made with a central hub of wood, which turns on an axle, from which spokes radiate to the wooden rim of the wheel. An iron tire or hoop, heated hot, so that it expands, is fastened on the rim, and as it cools it tightens, connecting the parts very firmly. Car-wheels are made either of iron or steel, or iron and steel, or of iron, steel and wood combined, and usually are solid, with the edge or rim fitted to the rail. Water-wheels (*q. v.*) are used for turning machinery by water. The overshot wheel has boxes or buckets on the rim. The buckets on one side fill with water and their weight makes the wheel turn, the buckets emptying themselves as they reach the bottom. The undershot wheel has flat boards, called floats, instead of buckets, and is used where there is plenty of water. The turbine-wheel is one that works flat instead of up and down. In machinery the sets of wheels are joined by bands or belts, or work by cogs or teeth. See Clock, Steamboat and Watch.

Wheel'er, Benjamin Ide, president of the University of California since July 18, 1899, was born in Randolph, Mass., July 15, 854. He graduated from Brown University in 1875. He received his A.M. in 1878; his Ph.D. from Heidelberg in 1885; and honorary LL.D from Harvard in 1900, Brown 1900, Yale 1901, Johns Hopkins 1902, Wisconsin 1904 and Columbia 1905. He was instructor at Brown University during 1879–81; and at Harvard in 1885–6. He became professor of comparative philology at Cornell in 1886 and at the American School of Classical Studies in Athens, Greece, in 1896. He is corresponding member of the *Kaiserliches Archæologisches Institut.* He is author of *The Greek Noun-Accent; Analogy in Language; Introduction to the History of Language; Dionysos and Immortality; Organization of Higher Education in the United States;* and *Life of Alexander the Great.* He was editor of the department of philology in *Johnson's Universal Cyclopedia* and in Macmillan's *Dictionary of Philosophy and Psychology.*

GENERAL WHEELER

Wheeler, Joseph, American soldier, a distinguished cavalry general of the Confederate army and in command of the cavalry division of the United States army of Santiago in the war with Spain, was born at Augusta, Ga., Sept. 10, 1836, and graduated at West Point in 1859. In April, 1861, he entered the Confederate army, and by the close of that year he rose to the rank of brigadier and later to that of major-general and lieutenant-general. He was at Shiloh, served under Bragg in the west, distinguished himself at Chickamauga, and opposed Sherman in his march through Georgia and South Carolina. During the war he was thrice wounded and had 16 horses shot under him. In 1869 he settled at Wheeler, Ala., where he became a planter and lawyer, and in 1880 was returned to Congress as a Democrat from Alabama, and served continuously until May, 1898, when he became major-general of volunteers, and was assigned to the command of the cavalry division in the army of Santiago. He was present at the battles of Las Guasimas and San Juan Hill, and was the senior member of the commission to arrange for the surrender of Santiago de Cuba. During 1899 General Wheeler was on service in the Philippines, and in August, 1900, he retired from the army, having reached the age-limit. He died on Jan. 25, 1906.

Wheeler, William Almon, nineteenth vice-president of the United States, was born at Malone, N. Y., on June 30, 1819. He began his political career as a state senator in 1858. In 1860 he was in Congress, and again during 1866–77. The compromise which allayed the disturbed condition of politics in Louisiana in 1874 was largely his work, and he was also foremost in returning his back-pay to the national treasury when the act increasing the salary of congressmen was passed. He was elected to the vice-presidency in 1876, when Hayes was president. He died on June 4, 1887.

Wheel'ing, W. Va., county-seat of Ohio County, in the narrow strip known as the Panhandle, on Ohio River. Part of the city is built on an island in the river, connected with the mainland by a suspension bridge. It has the capitol building, used for governmental purposes while it was the capital of West Virginia, postoffice, customhouse, public library, opera-house and other fine buildings. It is chiefly known as a manufacturing city, the coal in the region furnishing an abundance of cheap fuel as well as natural gas, which is used in many factories. There are blast-furnaces, iron-foundries and forges, manufactories of mowing and reaping machines, steam-engines, wagons, carriages, nails, leather, paper, extensive glass-factories, potteries and cigar-factories. It was the capital of West Virginia until 1870 and in 1875. Population 41,641.

Whelk, the name for marine gasteropod mollusks belonging especially to the family of *Buccinidæ.* The common whelk of the northern Atlantic is eaten in England. These animals look somewhat like very large snails. The shell is pointed, but has only a few whorls. The animal has a broad body, with tentacles projecting from the head. It can be entirely retracted within its shell. It burrows in the sand, and feeds on clams and other bivalve mollusks. Some whelks are used for bait.

Whig Party, The. (1) In British history one of the two political parties in the state, of an advanced and reforming character, now known as Liberals. The term had its origin in the middle of the 17th century and was applied to the Scotch Presbyterians (Covenanters as opposed to the Cavaliers), who had rebelled against the crown; and thus the appellation was at first regarded as a contemptuous epithet, hurled at them by the Tory party — the organization opposed to them in the state and favoring monarchy and conservative rule. The Whigs may be said to be the successors of the Cromwellian Roundheads, whose liberal principles led them to favor and defend the Revolution of 1688, insist upon parliamentary control of the government, and desire the Hanoverian rather than the Stuart rule. The influence of the party became powerful in the state from the era of George I, and was represented by the great Whig families of the time — Burke and Fox being its chief leaders. After the era of the Reform Bill (1832), a piece of legislation brought about by the Whigs, the latter term began to be replaced by that of the progressive and reforming Liberals. Goldwin Smith (*q. v.*) thus defines the two party names: "The Tory was the friend of government by prerogative and of church privilege; the Whig was the friend of constitutional liberty and toleration; in effect, the Tory was a supporter of monarchical, the Whig of parliamentary, supremacy. . . . In later times the Tory party became that of political and ecclesiastical reaction, the Whig party that of general progress."

(2) In American history the Whigs of the days of the American colonies were those who favored the Revolution, as opposed to the Tories, who advocated adherence to the mother country. The term more specifically dates, however, from 1830 and refers to the political party under the leadership of Henry Clay, known as National Republicans (or Whigs), as opposed to the Jackson, and later to the Democratic, Republicans. The Whigs favored a protective tariff, a national bank and a system of internal improvements. It was they who in 1840 elected W. H. Harrison to the presidency, and sought in 1844 to elect Clay to the office. With the election of Zachary Taylor the Whig party fell into a state of disintegration, many of the northern Whigs becoming Free Soilers and most southern Whigs becoming Democrats. The Whigs had a long line of representative leaders in the north; but the term fell into disuse, or, more correctly, gave place to that of Republicans — the last action of what remained of the Whig party being the nomination by the Constitutional Union party, in 1860, of Bell and Everett at Baltimore for the presidency and vice-presidency.

Whip'ple, Abraham, an American naval officer, was born at Providence, R. I. on Sept. 16, 1733. He commanded a privateer in the French and Indian War, and in one cruise took 23 French prizes. During the Revolutionary War his ship took more vessels than any other in the service. After his ship was finally taken by the British, he sailed for France with dispatches in a new ship and encountered the British merchant fleet of 150 vessels on its way to Jamaica. Hiding his guns and running up the British flag, he joined the fleet, and at night captured a vessel, putting on a crew from his own ship, and sent it to America. This he did until he had taken ten ships. He was taken prisoner near Charleston in 1780. His ship was the first American vessel to enter the Thames with the United States flag (1784). He moved west with the Ohio Company, dying at Marietta, O. on May 29, 1819.

Whip-Poor-Will, a bird widely known on account of its oft-repeated cry of *whip-poor-will*. It is not often seen, although it is abundant in damp woods of the eastern United States. It usually rests on the ground during the day and is active at twilight and early nightfall, sending forth its cry and also coursing low over the grass in search of insects. It is about ten inches long and of plain colors, being grayish, much variegated with black and buff. Its bill is very broad, its mouth large and provided with a tuft of long bristles. It builds no nest, but deposits its eggs on leaves or a slight depression in the ground. To the same family belong the chuck-will's-widow and the night-hawk.

Whirl'pool' is a current in a river, which moves in a circle, owing to opposite tides or winds. The two celebrated sea-whirlpools are Charybdis near Sicily and the maelstrom in the North Sea, which are not usually dangerous to ships; but, when the current and the wind are strongly opposed to each other, large ships are driven against the rocks. Whirlpools were dreaded by sailors and many legends arose about them. They were thought to be openings into great caverns, within whose depths lived mermaids and sea-monsters. Norwegian fishermen still believe that, if they can throw a heavy object into the whirlpool, it will close without injuring their ship. See MAELSTROM and SCYLLA.

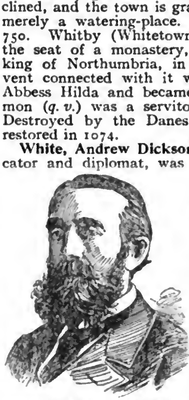
Whirl'wind', a small vortex motion of the earth's atmosphere, generally produced by the meeting of two contrary winds. Prof. R. W. Wood has shown a neat method of producing artificial whirlwinds. He heats a large iron plate — say four feet square — by placing a number of Bunsen burners underneath. While the plate is hot, a little sal-ammoniac is scattered over it. The fumes thus produced render visible the vortices formed by the two currents of air coming over opposite edges of the hot plate. See CYCLONE and STORM.

Whis'ky, a spirit or liquor distilled usually from grain of some kind, originating probably among the Celtic inhabitants of Ireland and Scotland, as the name is from the Celtic, meaning water of life. It was first known as *aqua vitæ* (water of life) and used only as a medicine, and was first used as a drink in Scotland in the 17th century. The tax on whisky, imposed partly for revenue but largely to reduce its use, resulted in evasions of the tax by illegal manufacture and smuggling. Whisky was first made from malted barley by distillation (*q. v.*), but can be made from any grain or even from potato-starch or grape-sugar. In the United States it is made largely from corn and rye. A great deal of whisky is made into alcohol, gin and French brandy. Whisky is nearly colorless when made, but grows red from the wood of the barrels in which it is kept, which are usually charred to help to darken it. It is improved by age. Over 50,000,000 gallons a year are made and consumed in Great Britain, besides beer and wine. In the United States the tax on whisky is one of the greatest sources of revenue to the government. The total production of whisky, distilled spirits and fermented liquors in the United States in 1906 was 180,860,926 gallons. About 45,000,000 gallons of whisky are made annually in this country.

JAMES WHISTLER

Whistler (*hwĭs'lẽr*), **James Abbott McNeill,** a brilliant Anglo-American painter, etcher and author, was born at Lowell, Mass., on July 10, 1834, and educated at West Point Military Academy. He studied art at Paris and settled at London, England, where he became president of the British Society of Artists and held exhibitions of his pictures. There was a strain of the erratic in his mental composition, which more than once brought him into antagonism with critics of art — notably with Ruskin; but he had genius and gifts of a high order in the impressionist school and attained eminence as an etcher and colorist. Some of his more important paintings include what he termed *A Nocturne in Blue and Gold*, arrangements in black, gray and green; his *Portrait of My Mother* is excellent, as are *The White Girl* and *The Last of Old Westminster.* He also did good work in painting portraits of celebrities, and wrote *The Gentle Art of Making Enemies.* His other published works include *Ten O'Clock, Four Masters of Etching* and *The Baronet and the Butterfly.* He died on July 17, 1903.

Whit'by, a seaport in Yorkshire, England, on the North Sea, at the mouth of the Esk. The old town has narrow, steep, irregular streets, while the new part has all the features of the fashionable watering-place. The old abbey is in ruins, but Whitby Hall has been restored. The parish church stands on a cliff 350 feet high, with a flight of nearly 200 steps. The piers run out about 1,000 feet in the ocean. The chief exports are jet ornaments and iron, the jet being obtained from a petrified wood peculiar to the region. The herring-fishery is increasing, but the shipping-trade, which was large when the vessels for Captain Cook's voyages were built here, has declined, and the town is gradually becoming merely a watering-place. Population 11,750. Whitby (Whitetown) originally was the seat of a monastery, built by Oswy, king of Northumbria, in 658. The convent connected with it was in charge of Abbess Hilda and became famous. Caedmon (*q. v.*) was a servitor of this abbey. Destroyed by the Danes in 867, it was restored in 1074.


ANDREW D. WHITE

White, Andrew Dickson, American educator and diplomat, was born at Homer, N.Y., on Nov. 7, 1832, and after graduating at Yale traveled and studied in France, and became an attaché to the United States legation at St. Petersburg. In 1857 he was appointed professor of history and English literature at the University of Michigan, and ten years later became president of Cornell University, a post which he held until 1885, contributing $100,000 from his own means, part of which was applied to the equipment of the library of the school of history and political science at Cornell. In 1871 he was appointed one of the United States commissioners to Santo Domingo; in 1878 was commissioner to the Paris Exposition from the state of New York; and from 1879 to 1881 was United States minister to Russia (serving again during 1892–4). In 1897 he was named by President McKinley ambassador of the United States to Berlin, a post he held till 1902. Dr. White is a regent of Smithsonian Institute at Washington, and has been president of the American Historical Society and the American Social Science Association. He is the author of *Lectures on History, The New Germany, The Warfare of Science, History of the Warfare of Science with Theology, European Schools of History, Studies in History* and *Autobiography.*

White, Edward Douglass, the chief justice of the United States supreme court, was born in the parish of Lafourche, La. on Nov. 3, 1845, and was educated at the Jesuit College of New Orleans and at Georgetown (D.C.) College. He served in the Confederate army during the Civil War, was admitted to the Louisiana bar, and in 1874 was a state senator. From 1878 to 1891 he sat as associate-justice of the supreme court of Louisiana, and from 1891 to 1894 was a member of the United States senate. In February, 1894, he was appointed associate-justice of the United States supreme court and in December, 1910, was appointed chief justice.

White, Henry Kirke, an English poet, was born on March 21, 1785, at Nottingham. His mother's ambition led to his being educated as a lawyer instead of following his father's business. His first poems attracted the attention of the owner of the paper, who advised publication of them in book-form. The volume was cruelly treated by the critics, but brought him the friendship of Southey and a scholarship at Cambridge. He is best known by the hymn entitled *The Star of Bethlehem.* He died at college on Oct. 16, 1806. His poems were published by Southey, with a memoir, which attracted public attention and sympathy.

White, Richard Grant, an American author, was born at New York City on May 22, 1821. Though a student of medicine and of law, he adopted a literary career, being for 14 years on *The Courier and Enquirer* of New York, part of the time as editor. The result of his studies and writings on music and art was *Christian Art.* Other works are *National Hymns, Poetry of the Civil War, Words and Their Uses* and *Every-Day English.* Among his best-known articles to the magazines, to which he contributed for 30 years, were those on the plays of Shakespeare. He died at New York on April 8, 1885.

White, Stewart Edward, an American author and story-writer who deals chiefly with western life, was born at Grand Rapids, Mich., on March 12, 1873. He entered the University of Michigan, from which he graduated in 1895, subsequently taking a course at Columbia Law School, New York City. Some years later he developed gifts as a novelist and successively published *The Claim Jumpers, The Westerners, The Blazed Trail, Conjurer's House, The Forest, The Magic Forest, The Silent Places, The Mountains, Blazed Trail Stories, The Pass* and *The Mystery,* the last in conjunction with S. H. Adams. Most of these are realistic studies of the rough life of the western plains, mountain passes and hillsides.

White, William Allen, American journalist and author, was born in Emporia, Kans., in 1868, and educated there and at the University of Kansas. Taking to journalism as a profession, Mr. White has been connected with *The Eldorado Daily Republican, The Kansas City Journal* and *The Star,* and in 1894 he purchased *The Emporia Gazette,* which he still edits and publishes. In the latter, in August of 1896, he wrote a striking article, which was widely commented on, entitled *What's the Matter with Kansas?* Besides a reprint of this article, Mr. White has issued collections of short stories dealing chiefly with American political life. These embrace *The Real Issue, The Court of Boyville, Stratagems and Spoils* and *In Our Town.*

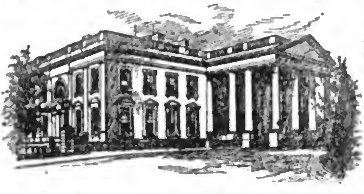
White Ant. See Ant.

White'bait', a name given in London to the translucent young of the herring and other similar fishes. They are salt-water fishes, but come up the Thames with the tide. Whitebait dinners are stylish and famous. The name is also given to small colorless fishes, living at considerable depths off the coast of China and Japan but approaching the shores to spawn in their season. They are considered a delicacy by English people living in China.

Whitefield (*whit'fēld*), **George,** an English preacher and reformer, was born at Gloucester, Dec. 16, 1714. While at Pembroke College, Oxford, he became associated with Wesley (*q. v.*) and his band of followers, who already were known as Methodists, and even among them was remarkable for his zeal, as shown in his labors in the jails. He preached his first sermon at Gloucester Cathedral, where the earnestness and eloquence of his oratory produced a great impression. Five persons are said to have gone crazy with excitement, but when complaint was made to the bishop he said that he hoped that "the madness would last till next Sunday." The same excitement attended his preaching in London, where the streets were filled in the early morning with persons carrying lanterns on their way to hear him preach, hours before the time of service. The clergy of the English church were offended at Whitefield's open-air preaching, which he soon used almost entirely, owing to their unwillingness to open their churches to him. He and Wesley separated on doctrinal points, and Whitefield's supporters, led by Lady Huntingdon, built him a large shed called The Tabernacle where immense crowds gathered. He paid seven visits to America, some of them lasting two or three years, where he preached to as large crowds as in England and Scotland, 20,000 persons hearing him at one time on Boston Common. His health failing, he put himself on what he called a short allowance — one sermon a day and three on Sunday. He died on his last visit to America, at Newburyport, Mass., Sept. 30, 1770. Consult *Life* by Tyerman; *Life and Times* by Philip; and Lecky's *History of England,* Vol. II.

White'fish', a common name for a number of fishes of pale or white color belonging to the salmon family. They are inhabitants mostly of lakes in the northern hemisphere. The name applies especially to the common whitefish of the great lakes of North America. This is the largest of the group, reaching a length of about 20 inches. It varies in appearance with age and condition. It ranges from the region of the great lakes north to the Arctic circle. It feeds on small crustacea, insects and minute organisms in the water. It is one of the finest food-fishes of America. The whiting is a slimmer and smaller variety of whitefish. The smallest and handsomest of the American whitefishes is the lake herring or cisco, a slender fish from ten to 15 inches long. In Europe the name of whitefish is given to any fish with silvery scales and without spots.

White House, the residence of the president of the United States, at Washington, D.C. It is a mile and a half from the capitol, on Pennsylvania Avenue. The corner-stone was laid in 1792, and President John Adams was the first to occupy it in 1800. In 1814 it was burned by the British and rebuilt and occupied again in 1818. The grounds cover about 75 acres, 20 being inclosed as private grounds. It is built of freestone, painted white, 170 feet long by 86 deep, with a circular porch in the rear and a colonnade in front. The architect was an Irishman, and the house is modeled after the duke of Leinster's palace at Dublin.



WHITE HOUSE OR EXECUTIVE MANSION

White Lady, a being who, according to German legend, appears in snow-white garments with a bunch of keys at her girdle, and sometimes watches over sleeping children. Bertha of Rosenberg, in Bohemia, is one of the most famous of these appearances, and Sir Walter Scott's *White Lady of Avenel* is also celebrated. Consult Baring-Gould's *Curious Myths of the Middle Ages.*

White Lead is one of the compounds of lead, called by chemists basic carbonate of lead, and is used extensively in the manufacture of paint. The Dutch process of manufacture is the oldest. Thin sheets of lead are rolled up and put into earthen vessels, which have some weak vinegar at the bottom. These vessels are surrounded with spent tan-bark or some other material which ferments readily, and thus produces heat and gives off carbon dioxide. The pots are thus left for about six weeks, when the lead is found either thickly coated or entirely changed into the white, basic carbonate of lead. This process is thought to give the best material for fine work, and is used in some of the American white-lead factories, but the patent process manufactures it more cheaply. There are 36 white-lead factories in the United States, the largest being at Brooklyn, and the product is 130,000 short tons a year. The lead used is brought from the Rocky Mountain region.

White Mountains, a chain of mountains in New England, commencing with Mt. Katahdin in Maine and crossing New Hampshire. It has 20 high peaks in New Hampshire, Mt. Washington, the highest, rising 6,293 feet. Mounts Pleasant, Franklin, Monroe, Jefferson, Adams, Madison and Lafayette are other summits. Mt. Washington is the highest point in New England and is a favorite summer-resort, with a hotel on its summit. The first mountain railroad in the world was built up this peak in 1868. White Mountain Notch, Franconia Notch and others are natural openings through which the rivers and railroads pass. At Franconia Notch are the famous profile of stone, 40 feet high, called the Old Man of the Mountains, and Profile Lake, known as the Old Man's Washbowl.

White Plains, N. Y., county-seat of Westchester County, 25 miles northeast of New York City. During the Revolutionary War, in October, 1776, it was held by Washington, while General Howe tried to get around the American army on Manhattan Island. There were several skirmishes, but Washington held the high ground above White Plains until November 5, when Howe moved to Dobbs Ferry and Washington began sending his troops into New Jersey. Population 16,500.

White River, a river of the United States, which rises in the Ozark Mountains, flowing through Missouri and Arkansas into the Mississippi, which it enters near the mouth of the Arkansas. It is 800 miles long, and is navigable for 350 miles.

White Sea, a great bay of the Arctic Ocean on the northern coast of Russia. It pierces the land for 350 miles, beginning with a width of 100 miles and narrowing to 35. It then sweeps south for 200 miles, and, widening, forms the Gulfs of Kandalak, Onega and Archangel. Its coast is about 1,000 miles long, and it covers about 47,000 square miles. Ice forms after August, 30 miles out, and does not melt till next July.

Whit'man, Walt, was born at West Hills, Long Island, N. Y., in 1819. As a young man he was school-teacher, printer, editor and builder. His early verses attracted little or no attention, but *Leaves of Grass* (1855) at once made him one of the most widely read of American poets. In the pieces which made up this book an irregular rhythm took the place of rime and measure. In this he but followed Matthew Arnold's *Strayed Reveller*, the Old-English poem of *Beowulf* etc. Whitman is variously called by his admirers "the poet of democracy" and "the good gray poet." Professor Beers says: "He liked the people—multitudes of people; the swarm of life beheld from a Broadway omnibus or a Brooklyn ferryboat. The rowdy and the negro truck-driver were closer to his sympathy than the gentleman and the scholar." Whitman himself said: "I sound my barbaric yawp over the roofs of the world." During the Civil War he gave himself up to the care of the wounded soldiers in the Washington hospitals, and about this experience he wrote his *Dresser*. In *Drum-Taps*, poems on the Civil War, is one of his finest pieces, *My Captain*, written after the assassination of Abraham Lincoln. In 1888 appeared his last volume, *November Boughs*. Whitman made his home in the latter part of his life at Camden, N. J., where he died on March 26, 1892. Consult Edmund Clarence Stedman's *Poets of America*.

WALT WHITMAN

Whit'ney, Eli. One fine morning in 1793 a young man with a serious, New England type of face, was sitting in his room in a big plantation-house on Savannah River, Georgia, engaged in studying law. A company of rich planters had arrived from Augusta, and were being entertained by the mistress, the widow of General Nathanael Greene (*q.v.*), a hero of the Revolutionary War. So the young man had withdrawn to his own quiet quarters. Presently he was interrupted by a black servant who said that Mrs. Greene and the gentlemen wished to see him in the drawing-room. He went immediately.

ELI WHITNEY

"Gentlemen," said Mrs. Greene, "this is my ingenious young friend, Mr. Whitney, who has just been graduated from Yale College. Explain what you require, and I am sure he can help you."

"Will you please invent for us a machine for ginning cotton, and do it as soon as possible? The south has unlimited acres for cotton-growing, and the new inventions in England for spinning and weaving have increased the demand enormously. But there is no use in our growing the cotton so long as the fiber must be separated from the seed by hand."

The man to whom interested people would turn in such an emergency could have been nothing less than remarkable. Eli Whitney was 28 years old. He was born on Dec. 8, 1765, a month later than Robert Fulton. But his birthplace was Westboro, Massachusetts, and his ancestry Puritan. His home was a plain, bare farmhouse; his father a stern, unimaginative man who brought his children up to hard work and few pleasures. Every New England farmer at that time had a workshop, and Eli showed such skill in making and mending the many articles needed in house, stable and field, that the shop was practically turned over to him. One cold Sunday, when sickness kept him home from church, he took his father's silver watch apart and put it together again so well that no one knew it had been meddled with. He mended violins and made nails on a little forge during the Revolutionary War, when the supply from abroad failed. Of course he went to school and learned to read and write and cipher. When he was 19, he set about earning enough money to go to Yale College. But it was a long, hard task, and he was 27 when he graduated. He accepted an offer of a position as a teacher in a private school in the south, intending to use his spare time in the study of law.

On the voyage from New York to Savannah he had the brilliant and wealthy Mrs. Greene for a fellow-passenger, who soon discovered that Eli Whitney was no ordinary young man. So, when he discovered that the position was not what it was represented to be, Mrs. Greene insisted that he be her guest until he could place himself to better advantage. His mechanical skill that had supported him through college was now turned to many services for the gracious lady who had befriended him. Thus it came about that law-books were abandoned, and Eli Whitney won fame as the inventor of the machine that brought wealth to the south.

The problem presented was this: There are two varieties of cotton as of peaches — the freestone and the clingstone. Cotton with the loose seed is easily managed by a simple contrivance, like the clothes-wringer, that presses the seed out. This is the sea-island cotton that grows only near water. The tight-seeded cotton-plant that flourishes inland had to have the fibers pulled from the embedded seeds by hand, a slow and expensive process, even when there were slaves to do the work.

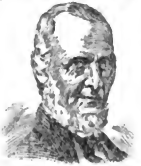
Eli Whitney had never examined a cotton-boll when he was asked to invent the gin, but he got the idea at once that only *fingers* of some sort could do the work. Mr. Miller, Mrs. Greene's overseer, agreed to furnish the money for the experiments, and a shop was fitted for Whitney in the basement of the plantation house. The gin consisted of a boxlike enclosure below an open hopper. Inside was a cylinder set with rows of sharp wire-teeth, the whole turning with a crank. A slotted steel-plate half enclosed the cylinder, the teeth slipping through the slots as the crank was turned. As the teeth extended beyond the slots, they caught the fibers and tore them from the seeds, the bolls dropping down from the hopper and the stripped seeds falling through a crevice below. It was a simple device of mechanics, and involved no such principles as lay behind the steam-engine. Its importance was measured by the immediate and tremendous effect the invention had on the south.

The inventor never profited by it financially. His machine was stolen and copied as soon as it was completed; his patent was infringed; his factory burned; his business injured by greed and malice; and lawsuits consumed his earnings and dragged through the courts until the patent's limit of 14 years had expired. His claim to the *honor* of the invention was finally established, and with that he had to content himself. At 40 he was penniless but not defeated. With fame, business ability, rare mechanical genius and a clean name as assets he started an armory, securing not only government orders, but an advance of public money. No firearms were made in the country so good as those of England. By 1807 it was practically certain that the United States would be compelled to fight another war with Great Britain for proprotection of our mercantile marine. Eli Whitney could be trusted to make good guns and honest guns. So he built his armory near New Haven, Ct., and Whitneyville grew up around it. He had to design all the parts of the improved gun, invent many of the machines used, and train workmen into skilled artizans. His boyhood motto had been: "Whatever is worth doing is worth doing well." This he put into practice. In his factory he instituted the principle of the division and direction of labor that made Arkwright's cotton-mills in England so effective. The great inventor never bcame so rich as he might have been. Better than money he loved his family and friends, beautiful things and the society of refined and cultivated people. His sister was his dearest friend; his brother a partner in business; he was never too busy to play the devoted lover to his wife or to contrive ingenious toys for his children. His long, fruitless toil to secure his rights in the cotton-gin and the dishonesty, envy and greed that had pursued him for a dozen years left no bitterness behind to poison his life. Prosperity, happiness and renown crowned his later years. He died on Jan. 8, 1825, and was buried in New Haven. Consult Frances M. Perry's *Four American Inventors*. See COTTON, SLAVERY and UNITED STATES (*History*).

Whitney, William Collins, was born at Conway, Mass., July 15, 1841. He studied at Williston Academy, Easthampton, Mass., and graduated at Yale College in 1863. He next studied law, began to practice in New York in 1865, and soon had a large business. His father was a prominent Democrat, and Whitney also became interested in politics in New York City. In 1885 he became secretary of the navy in President Cleveland's cabinet. During his term of office new vessels were added to the navy, and Mr. Whitney is regarded as having been an especially able secretary. He died on February 2, 1904.

Whitney, William Dwight, American philologist, brother of J. D. Whitney the distinguished geologist, was born at Northampton, Mass., Feb. 9, 1827, and died at New Haven, Conn., June 7, 1894. In 1845 he graduated from Williams College, and for several years was employed in a bank at Northampton, meanwhile studying Sanskrit and other languages there, at New Haven and later at Berlin. In 1853 he was appointed professor of Sanskrit at Yale, and in 1870 had added to his chair that of comparative philology in the same institution. Professor Whitney gained a European as well as national fame as a philologist and an expositor of the science of language. His published works, besides a *German Grammar and Reader* and a *Grammar of Sanskrit*, include a work on the *Life and Growth of Language*. He also was editor-in-chief of *The Century Dictionary of the English Language*, completed in 1891. He was president of the American Oriental Society and first president of the American Philological Association.

Whit'tier, John Greenleaf, the Quaker poet, was born in a farmhouse near Haverhill, Mass., Dec. 17, 1807. Here and at the neighboring town of Amesbury most of his life was spent. All the schooling he received was at the district school, with two years at Haverhill Academy. A copy of Burns awoke a desire to write, and he began to send verses to Garrison's *Free Press* and the local newspaper. For a short



JOHN GREENLEAF WHITTIER

time he was editor of *The Manufacturer* at Boston, and for a year and a half edited George D. Prentice's paper, *The New England Weekly Review*, at Hartford. At Hartford he published his first volume of verses — *Legends of New England* (1831). Whittier was back in Haverhill, engaged in farming, when the antislavery movement began, into which he threw himself with the greatest enthusiasm. In 1833 he published a tract against slavery; he helped to found the American Antislavery Society at Philadelphia; and he became the poet of the movement, writing for it his *Voices of Freedom* in 1849 and his *Ichabod*. In 1838–9 he edited *The Pennsylvania Freeman* at Philadelphia, where his office was sacked and burned by a mob. *Laus Deo* was his last poem of freedom, written on hearing the bells ring for the passage of the constitutional amendment abolishing slavery. His chief works are *Maud Muller*, *Home Ballads*, *Miriam*, *National Lyrics*, *Poems of Nature*, *Among the Hills*, *In War Time* and *Ballads of New England*. Among Whittier's larger poems are *Snow-Bound* (*q. v.*), *The Bridal of Pennacook* and *The Tent on the Beach*. He died on Sept. 7, 1892. Consult Stedman's *Poets of America* and H. A. Beers' *American Literature*.

Whit'tington, Sir **Richard,** was born at Pauntley, Gloucestershire, England, about 1356. According to the well-known story, his father died when Richard was ten, and he tramped to London, where he became a merchant's apprentice. At one time he started to run away from his master, but, while seated at the foot of Highgate Hill, seemed to hear in a chime of bells

> Turn again, Whittington,
> Thrice lord mayor of London town.

He did so; married his master's daughter, and became wealthy, his first stroke of business having been to send a cat to an eastern market; was lord mayor of London in 1397; and made loans to Henry IV and Henry V. Whittington died in 1423.

Wichita (*wĭch'ĭ-ta*), **Kas.,** county-seat of Sedgwick County, on Arkansas River, in the midst of a very fertile region. It has 60 miles of street-car lines; factories and packing-houses employing 1,500 workmen; and six railroads. There are good public schools, a high school, a medical college, Lewis Academy, Fairmount College and Wichita University. Its growth has been very rapid. It was settled in 1869 and incorporated in 1870; in 1880 the population was 4,911; in 1900 24,671; in 1910 52,450, and is now 67,847.

Wieland (*vē'lant*), **Christoph Martin,** a German poet and novelist, was born at Oberholzheim, Swabia,Sept. 5, 1733. He was carefully taught byhis father, a clergyman. In 1750 he went to the University of Tubingen, where he devoted himself a little to law and very much to literature, and wrote his poem on *The Nature of Things*. After some years in Switzerland, where he supported himself by tutoring and wrote poems and plays, he settled in 1760 at Biberach as director of the Chancery. From 1769 to 1772 he was professor of philosophy at Erfurt, after which he made his home at Weimar. Here he tutored and also edited a monthly magazine, writing an immense number of poems and articles for it. His *Oberon* is held to be the best of his works. Wieland's romances were highly popular, and have not yet been surpassed in Germany. To him also belongs the merit of having first suggested to his countrymen that it might be worth while to study their own literature as well as that of France, England and Italy. He died at Weimar, Jan. 20, 1813.

Wiesbaden (*vēs-bä'den*), a fashionable watering-place of Prussia, stands on the slopes of Mount Taunus, five miles north of Mainz and three miles from the Rhine. Its prosperity is due entirely to its hot springs, and it is filled with hotels, lodging-houses, villas, bath-houses and promenades for the benefit of its 60,000 yearly visitors. The main buildings are the palace, the *Kursal*, the five-towered Protestant church, the Roman Catholic church, the museum with a picture-gallery and a library of 75,000 volumes and the synagogue built in Moorish style. The chief spring is the *Kochbrunnen*, the waters of which are drunk, besides which there are 28 other springs used for bathing. These springs were known to the Romans, who fortified the place. Population 109,033.

Wigan (*wĭg'an*), a city of Lancashire, England, on Douglas River, 18 miles northwest of Manchester and northeast of Liverpool. It is joined by rail and canal with these cities and with London. The main buildings are All-Saints' Church, Albert Edward Infirmary and Dispensary, the arcade, public library and public baths. A park covering 27 acres was opened in 1878. The growth of the city is due largely to its coal-mines, which employ a large part of the people and furnish cheap fuel for its cotton and iron mills. Wigan was a Roman station and later a Danish town. Three battles were fought there during the Civil War of Charles I and the Commonwealth. Population, as extended, 82,434.

Wig'gin, Kate Douglas. See Riggs, Mrs.

Wight, Isle of, a small island in the English Channel, off the coast of Hampshire, separated from the mainland by the narrow strait of the Solent and by Spithead. It is 23 miles long and 13 broad, and covers about 145 square miles. High chalk-downs cross the center of the island from east to west. Along the south coast is the Undercliff, a district noted for its wild scenery and mild climate, where a large hospital has been built. The isle has long been a favorite place for tourists, and there are fashionable watering places at Cowes, Ryde and other places. Farming, sheepraising, shipbuilding and cement-making are carried on. Vespasian conquered the Celts of the Isle of Wight in A. D. 43. From the time of Henry VII it was ruled by a royal captain or governor. Charles I was imprisoned in Carisbrooke Castle, a fine old ruin, the inner walls of which were built in the 11th century. Near Brading are the remains of a Roman villa. Population 86,000.

Wil'berforce, William, an English philanthropist, was born at Hull, Aug. 24, 1759. He attended Cambridge University, and in 1780 was elected to the house of commons, where he became a friend of Pitt. In 1787 he first began to stir up opinion against the slave-trade, in which he was seconded by Pitt and Thomas Clarkson. Clarkson carried on the work in the country, while Wilberforce endeavored to gain the house of commons. By 1789 he succeeded in getting the subject before the house, but the friends of the planters were too strong, and the matter was postponed. In 1791 he brought it to a vote, but the motion for abolition was lost. He never ceased his efforts, but it was not till 1807, a year after Pitt's death, that the first great step toward doing away with slavery (*q. v.*) was taken, and it was not till a month after his own death that the emancipation bill, which owed so much to his efforts, was passed. Wilberforce also had a leading part in religious measures in Parliament and in religious work out of it. He died on July 29, 1833, and was buried in Westminster Abbey, where a monument has been set up to his memory. Consult *Life* by his sons.

Wil'cox, Ella (Wheeler), was born in 1855 in Johnstown Center, Wisconsin. As early as 14 she wrote poetry that was accepted by the press, and before she was 20 she had secured more than local celebrity. She attended the University of Wisconsin in 1884, but did not graduate. Her early years were a struggle against poverty. She married Robert M. Wilcox, and thus became a resident of Short Beach, Connecticut, where she still lives. She is most widely known through her articles written for *The New York Journal* (*American*) and for *The Chicago American*. But in the following collections of poems there may be elements that will secure her more permanent fame: *Every-Day Thoughts*, *Poems of Passion*, *Poems of Pleasure*, *Poems of Power*, *Kingdom of Love* and *Three Women*. Her prose includes *A Double Life* and *Was it Suicide?* In these her work, as she has said, consists in "putting philosophy, religion, morality, psychology and science on a common-sense plane for everyday use." Perhaps this purpose is best realized in *A Woman of the World*. This is a series of letters, written to people young and old, at important moments in their careers. Her poetry, when it deals with everyday subjects, sometimes has much melody, aptness and sweetness; but the attempts to reach the realms of intense passion or of higher speculation are marked, as a rule, by a loss of these qualities and by failure to say anything of much significance. Her prose contains practical wisdom, and should serve to break down some of the intellectual barriers that her readers face. Her philosophy is one of optimism and even of exhilaration. For her estimate of herself see *The Cosmopolitan* for December, 1906.

Wilhelmina (*vĭl'hĕl-mē'nȧ*), **Helena Pauline Maria,** queen of the Netherlands, was born at The Hague, Holland, Aug. 31, 1880, and is the only child of the late King William III and Princess Emma, his second wife, daughter of Prince George Victor of Waldeck. She succeeded to the throne on the death of her father, Nov. 23, 1890, though she only came of legal age eight years later (1898) when she was crowned queen. On Feb. 7, 1901, she married Prince Henry, youngest son of the late grandduke of Mecklenburg-Schwerin. Queen Wilhelmina is the fourth in the list of sovereigns of the Netherlands of the house of Orange since the reconstruction of the kingdom by the congress of Vienna (1814–5). Her Majesty possesses simple tastes, and is an accomplished linguist and experienced horsewoman.

Wilkes, Charles, an American naval officer, was born at New York in 1801. At 15 he entered the navy. In 1826 he was made lieutenant, and four years later was attached to the naval bureau of charts and instruments at Washington. Here he made the first astronomical observations in America. In 1838 he was given command of a squadron of six ships, with which he surveyed the Samoan Islands, discovered other Pacific Islands and the Antarctic continent, and explored the Fiji Islands. On coming back to Washington he published his *Narrative of the United States Exploring Expedition*, and was made a commander. In 1861, as captain of the United States steamer *San Jacinto*, he seized the Confederate commissioners to England — Mason and Slidell — on board the British steamer *Trent*, and carried them to Boston. This was the *Trent* affair between the United States and England, and resulted in the commissioners being set free. In 1862 Captain Wilkes was made commodore. He died at Washington, D. C., Feb. 8, 1877.

Wilkes'-Barre, Pa., county-seat of Luzerne County, on the north branch of Susquehanna River, in Wyoming Valley, 98 miles northwest of Philadelphia. The city is built partly on the bottom-lands and partly on the surrounding hills. It is entered by four railroads. Wilkes-Barre is in the midst of a great coal-mining district, and is a center for mining-supplies and for coal-shipment, besides having important manufactures of locomotives, leather-goods, lace, cutlery, wire-rope and steel, as well as foundries, wirework and silk-mills. Notable public buildings are the city-hall, courthouse, post-office, jail, armory and Memorial Hall. It has excellent public and parochial schools, and is the seat of Harry Hillman Academy (for boys), Wilkes-Barre Institute (for girls), Wilkes-Barre Business College and St. Mary's and St. Anne's Academies. Besides these educational institutions there are two large public libraries, while the Y. M. C. A. and the Law and Library Association and other organizations have library collections. Wilkes-Barre was settled in 1770, but eight years afterward the whole region was laid waste by the Wyoming (*q.v.*) massacre, the town being sacked and burnt. The same year a fort was built and the town rebuilt. Its growth is mainly since 1855. Population 67,105.

Wil'kie, Sir **David,** a Scottish painter, was born at Cults, Fifeshire, Nov. 18, 1785. His father, who was a clergyman, placed him in 1799 in Edinburgh Academy, where he gained a prize for his *Callisto in the Bath of Diana*. He settled at London in 1805. In 1836 he was knighted. In 1840 he painted the portrait of the sultan and made a trip to Palestine. As he was returning to England, he died at sea, June 1, 1841. Among his best pictures are *Blindman's Buff*, *Guess My Name* and *Reading the Will*. Consult his *Life* by Allan Cunningham.

Wil'kinsburg, Pa., a borough of Alleghany County, joining Pittsburgh on its eastern side, seven miles from Union Depot, is entirely a residence town, planing-mills and an ice-plant being the only industries. The majority of the people are employed in Pittsburgh. It has 13 churches, five fine school-buildings, two homes for the aged, a large hospital (managed by the United Presbyterian Church), is served by one railroad, and operates five car-lines to Pittsburgh. Population 18,924.

Wil'kinson, James, an American soldier, though of English parentage, was born in or near Benedict, Md., in 1757. He was privately educated, and in 1773–5 studied medicine in Philadelphia. Relinquishing the latter as a pursuit, he entered the American army at Boston, and with the rank of captain he took part in the invasion of Canada, joining Arnold at Lachine, on the St. Lawrence, with his command. As colonel, he acted for a time on General Gates' staff, and was appointed deputy adjutant-general of the Army of the Northern Department. Though implicated in the Conway scandal (see GATES, HORATIO), Wilkinson served with distinction in the Saratoga campaign and was the bearer to Congress of the news of the surrender of Burgoyne at Saratoga. Though he held various high positions after this and was made a brigadier-general (brevet rank), he became disaffected, and, irate at the criticisms passed upon him, he resigned. At the close of the war he emigrated to Kentucky and engaged in trade at Lexington and in the Mississippi Valley. Here he so far forgot his old allegiance as to propose to Spain to transfer Kentucky and the country beyond the Alleghanies to that power. Recovering his reason, he then sought to reinstate himself in the good graces of his own nation, enlisted in the army under Gen. Anthony Wayne, and indeed succeeded that officer in the latter's command after doing good service against the Indians of the Northwest. In 1805 he became governor of Louisiana; but his duplicity, in connection now with the Aaron Burr conspiracy, once more got him into trouble. Though arraigned and court-martialed for this, he was acquitted, and subsequently served in the War of 1812 in the chief command of the Northern Department. In this position he again fell from grace and was accused of inefficiency and drunkenness, but after trial was once more acquitted and honorably discharged from the army. His subsequent career was spent in Mexico, where he died on Dec. 28, 1825.

Willamette (*wĭl-lä'mĕt*) **River,** the main branch of the Columbia west of the Cascade Mountains, is formed near Eugene City by the junction of three streams which rise in the Cascade Range. It flows north 155 miles, and falls into the Columbia 110 miles from its mouth. It is navigable for 126 miles above Portland for steamboats. Locks have been built around the falls at Oregon City at a cost of $450,000. The chief city on its banks is Portland, and the Willamette Valley is the most thickly settled of any part of Oregon.

Wil'lard, Emma (Hart), American educator and author, was born at Berlin, Conn., on Feb. 23, 1787, and educated privately. At an early age she began to teach, taking positions in Hartford and Westfield, Conn., and later at Middlebury, Vt., where she became principal of an academy for girls, with a boarding-house attached. At Middlebury in 1809 she married John Willard, who died in 1825. Pursuing her professional lifework as a teacher, she connected herself with a seminary for girls at Waterford, N. Y., for which she was instrumental in obtaining partial support from the state. This was in 1821 removed to Troy, a building being offered to Mrs. Willard by the city, and the school, under her excellent and devoted management, became favorably known as Troy Female Seminary. The principalship of this institution she later transferred to John Hart Willard, her son, and in 1838 she removed and settled in Hartford, Conn., there marrying Christopher C. Yates, with whom, however, she did not live happily. Subsequently she parted from him and reässumed the name of her first husband. In 1830 she made a tour in Europe, of which an account was published as *Journals and Letters from France and Great Britain.* From the profits of this publication she helped for a time to support a school for women in Athens, Greece, which she had founded. Besides her numerous published writings, which include a *History of the United States*, a *Universal History in Perspective*, *Last Leaves of American History* and *Morals for the Young*, she edited a geography and atlas, and wrote and issued a volume of poems, the best known perhaps of which is the song *Rocked in the Cradle of the Deep.* Mrs .Willard died at Troy, N. Y., on April 15, 1870.

FRANCES E. WILLARD

Willard, Frances Elizabeth. This gentle Christian reformer and practical philanthropist is the best loved and most widely celebrated of all American women. To her devotion and trained ability is due the phenomenal growth of the Woman's Christian Temperance Union and very largely of the prohibition movement. Born at Churchville, near Rochester, N. Y., on Sept. 28, 1839, she was fortunate in having parents of rare moral and intellectual character. To give their older children educational advantages, they removed to the college-town of Oberlin, Ohio. When Frances was seven they settled on a farm near Janesville, Wisconsin. A beautiful tract it was, half prairie, half forest. For ten years the family depended upon itself for society, and the mother stored her children's minds with elevating verse and Bible stories. At 17 Frances was sent to Milwaukee to school and afterwards to the Woman's College at Evanston, near Chicago. For the next 40 years this was her home. She became dean of her own *alma mater*, resigning in 1874 when the college was incorporated with Northwestern University.

Turning from the most attractive offers to go on with teaching or to enter journalism, she decided to go into the temperance movement, joining a little band of women without money or experience in Chicago. The matter was talked about, for she was a noted woman of proved leadership in the educational world. To the W. C. T. U. she gave immediate impetus by the conversion of hundreds of men from drunkards to useful citizens. She consented to accept a salary sufficient to provide for her mother and herself and, finally, the modest gift of Rest Cottage, the home in Evanston, but her earnings as lecturer and writer she turned into the W. C. T. U. fund. Five years after beginning the work, Miss Willard was elected president of the national W. C. T. U., —an office she filled for 20 years. She insisted upon the adoption of a demand for woman suffrage by the organization on the ground that the ballot was the most effectual weapon to defend the home. To her, also, is due the fact that the W. C. T. U. practically is a unit politically. She took the position that little help was to be expected from the old parties. The Prohibitionists held their first national convention in 1884.

After 1880 Miss Willard was almost continually engaged in travel and in organizing states and foreign countries. The movement spread until at the time of her death in 1898, 35 nations had lined up under the white ribbon. In addition to this work she wrote eight books, established and helped edit *The Union Signal*, inspired the Chicago organization to build the Woman's Temple at a cost of $1,000,000, to establish the W. C. T. U Home for working-women, a publication-office and national headquarters. All of this grew in 25 years from a beginning so small that Miss Willard could not always get money for carfare and lunches, while the national W. C. T. U. had a total income of only $1 200. In her annual addresses are to be found the history and the policy of the temperance movement of her time.

A scholarly, refined, reserved woman, Miss Willard was aggressive only in act never in manner. She died on Feb. 18, 1898. A statue of her has been placed in Statuary Hall, in the Capitol at Washington, among those of presidents, statesmen and military heroes.

Consult her *Life* by Anna Gordon, her private secretary, published by the National W. C. T. U., Evanston, Ill.

William I, the Conqueror, son of Duke Robert of Normandy, was born in 1027 or 1028, and became duke in 1035. His guardians had to fight to make good his claim to the dukedom, and more than once his life was in danger. On visiting England, where Edward the Confessor then reigned, William found Norman influence strong at Edward's court, and felt sure that the crown would pass to him. But the *Witenagemote* chose Harold as king, ignoring William's claims. The Conqueror at once invaded England, and won the battle of Hastings and the throne, Oct. 14, 1066. He at first ruled the conquered English mildly, but an uprising in 1070 was savagely put down, and the hatred between English and Norman thereby aroused forced him to rule harshly. The English were deprived of office, and ground down by taxes, while fortresses garrisoned by Normans were built throughout the country. In 1072 Scotland was invaded and King Malcolm Canmore forced to acknowledge William's authority. A civil war with Robert, his son, was ended through the intercession of Queen Matilda. Most of the latter part of William's life was spent in Normandy, the government of England being intrusted to Bishop Odo, his half-brother. William was rather fat, and a sarcastic remark about his fatness by Philip I of France caused William to raise an army and invade France. He captured and set fire to Mantes, but while watching the blaze he was thrown from his horse, and died on Sept. 9, 1087. Not only was William a successful soldier, but he knew how to rule, and England had never before been so well-governed. Consult Freeman's *History of the Norman Conquest*. See ENGLAND, FRANCE, NORMANDY and NORTHMEN.

William II of England, surnamed Rufus, the second son of William the Conqueror, was born in Normandy in 1056. The celebrated Archbishop Lanfranc was his teacher, and he was his father's favorite son. He had no sooner been crowned, Sept. 26, 1087, than Robert, his older brother, who had inherited Normandy, tried to stir up an insurrection in England. In return William invaded Normandy in 1091. When a peace had been patched up between them, they joined arms against Henry, the third brother, and drove him from Cotentin, a district covering a third of Normandy, which he had bought from Robert. These scenes of strife were carried on throughout William's reign. He invaded Scotland, waged a second war against Robert, and engaged in putting down disturbances in Wales and the north of England. Robert, on leaving for the crusades, sold Normandy to his brother for $50,000. William Rufus' last campaign was in defense of a part of his newly acquired possession, the district of Maine, which was claimed by a chieftain named Helias de la Flèche. He was shot accidentally by an arrow, supposed to have come from the bow of Sir Walter Tyrrel, while hunting in the New Forest, Aug. 2, 1100. Consult Freeman's *Reign of William Rufus*.

William III of England, the son of William II of Orange and Mary, oldest daughter of Charles I of England, was born at The Hague on Nov. 4, 1650. Oliver Cromwell had the young prince shut out from the stadtholdership of the United Provinces, but on the murder of De Witt, William, then 22 years old, was chosen stadtholder. He found the republic in the midst of a seemingly hopeless struggle with Louis XIV, but his ability as a general and his skill as a diplomat at the end of seven years won an honorable peace by the treaty of Nimeguen in 1678. This achievement made him famous throughout Europe. By an alliance, formed at Augsburg in 1686, William became the head of a league of German princes, including Spain and Sweden, against Louis XIV. William had married Mary, the oldest daughter of James II, and to escape that monarch's tyranny the English now looked to the stadtholder as their only hope. He had but to land, Nov. 5, 1688, to bring the whole country to his support, and William and Mary were crowned joint sovereigns. Ireland, however, did not submit until after a two years' contest, and throughout William's reign plots were hatched against his life by the followers of the Stuarts. The league, now strengthened by the addition of England, vigorously carried on its war with France, but the English people never were heartily in favor of it, and William was forced by home pressure and defeats in the field to make the peace of Ryswick in 1697. His reign in England was one of great progress in real liberty for the English people, and William is acknowledged to have been one of the ablest of English kings. He died on March 8, 1702. Consult Macaulay's *History of England* and Traill's *William III*.

William IV of England, the third son of George III, was born at Windsor, Aug. 21, 1765. When 14, he was sent to sea as a midshipman under Admiral Digby. Next he sailed under Admiral Rodney, and took part in the action off Cape St. Vincent. During the remainder of the war the prince saw plenty of service. In 1789 he was made Duke of Clarence. He joined his brothers, the prince of Wales and the duke of York, in their opposition to the king, and took his seat in the house of lords. In 1827, on the death of the duke of York, William became heir to the throne, and was crowned king on June 28, 1830. The great event of his reign was the passage of the reform bill, June 4, 1832. He died on June 20, 1837. See Greville's *Memoirs* and Fitzgerald's *William IV*.

William I, king of Prussia and German emperor, was the second son of Frederick William III of Prussia. He was born at Berlin, March 22, 1797. Though a delicate child, he became one of the most vigorous men in Germany. Made a captain in 1813, he accompanied his father in the campaign of 1814, and next year was given the iron cross for his bravery at Bar-sur-Aube. When 21, he was made major-general, and mastered the military system of his own and other European countries. On the accession of Frederick William IV, his brother, in 1840, he became heir to the throne and was made Prince of Prussia.

At the outbreak of the revolutionary movement, in 1848, William saw that some of the demands for a freer government must be granted, but urged that order should first be restored. At this time he was the best hated man in Germany. In 1849 he skillfully crushed the rebellion in the grand-duchy of Baden, at which time an attempt was made upon his life. On Jan. 2, 1861, he became king of Prussia as William I. The successful wars against Denmark and Austria changed the feelings of his subjects toward him, and on his return to Berlin he was received with unbounded enthusiasm, being looked upon from this time as the father of his people. On the outbreak of the war with France, in 1870, all Germans rallied round the king of Prussia, and, when he quitted Berlin to join his army, he knew he had the support of a united nation. He personally commanded at the battles of Gravelotte and Sedan, and during the siege of Paris was proclaimed German emperor, Jan. 18, 1871. He left the destinies of Germany almost entirely in the hands of Bismarck, the chancellor of the empire. William died at Berlin, March 9, 1888. Consult A. Forbes' *Life of Emperor William.*

William II, ex-emperor of Germany and king of Prussia, eldest son of Emperor Frederick III. of Germany and Victoria, Princess Royal of Great Britain, was born January 27, 1859. From his youth up he seems to have been possessed with that conception of his destiny as a conqueror which finally plunged the world in blood. The study of the military art which a century before had occasioned the remark of Mirabeau, "war is the leading industry of Prussia," became a passion. A man of inordinate egotism and ambition combined with tireless energy, tenacity of purpose, indomitable will, and a brilliant, though unbalanced mind, the new emperor became the leading spirit among the Pan-German military element, the sinister significance of whose motto, "Deutschland Uber Alles" ("Germany over all") was disclosed to the world by the events which followed August 1, 1914. The development of the German navy so that it was second only to that of Great Britain was due to his personal initiative. In answer to the inference drawn that this increase of the navy was directed toward eventual hostilities with England, an inference supported by the frank declaration of the German General Bernhardi in his book, "Germany and the Next War," the emperor maintained that "every German Warship launched is one guaranty more for peace on earth" and that Germany's great army had a similar purpose. But the years of peace which followed his accession were in reality a period of preparation for the world empire to which the emperor said, in several speeches, Germany aspired. This was shown by the facts which came out following the invasion of Belgium. This world conquest was to be achieved by an utter disregard of the rules of civilized warfare and all restrictions of honor. The treaty with Belgium became a mere "scrap of paper." Unarmed vessels with their crews and passengers of women and children sunk, undefended cities and field hospitals bombarded, women used as screens for the advance of troops—these were only a few of the barbarities which were deliberately practiced as part of the German system of "frightfulness" and provided for in the official German War Manual published in 1902.

It is to the emperor himself that the Germans owe the name "Huns." Addressing his troops about to sail for China at the time of the Boxer rising (*q. v.*), he said:

> "When you come upon the enemy, no quarter will be given. As the Huns a thousand years ago made a name for themselves which is still mighty, so may the name of Germany in China be kept alive," etc.

Previous to the European War (*q. v.*) he was thoroughly possessed by the idea of the superiority of German "Kultur" (culture) and his duty to Germanize the world. "God," said he, "has called us to civilize mankind." The complete defeat of Germany was followed by the abdication of the Emperor and the Crown Prince and the overthrow of the imperial government.

The emperor married the Princess Auguste Victoria, daughter of Frederick, Duke of Augustenburg, February 27, 1881. Wilhelm, Crown Prince, was born May 6, 1882, the eldest of a family of six sons and one daughter.

William, Prince of Orange, called William the Silent, was, as a matter of fact, an admirable converser and an eloquent and effective speaker. It was during his residence in France as a diplomatist that he showed that he knew when to keep silent as well as when to talk and so was named by the French, *le Taciturne* (The Silent)—a historic nickname which does not express the man at all unless one knows the circumstances under which it was conferred.

He was born at Dillenburg, Nassau, April 16, 1533. As a boy he was a page in the court of Charles V., who gave him command of a body of troops and employed him on the diplomatic missions referred to. His successor, Philip II., appointed William one of the State Council to help Margaret of Parma to rule the Netherlands as regent, but William opposed the prosecution of the Protestants and when, as a result of the barbarities of the Duke of Alva, a revolt flamed through Holland, Utrecht, Zealand, Friesland, Gelderland, Groningen and Overyssel he, in 1579, formed a league between these provinces which was the foundation of the Dutch Republic and on July 26, 1581, the United Provinces declared themselves independent. He was the foremost statesman of his time, a man of great resource, sterling integrity, and a courage that no disaster could shake. A price was placed upon his head by King Philip as a result of which he was assassinated at Delft, July 10, 1584. Maurice of Nassau, who distinguished himself in the

Thirty Years' War, was a son of his. William III of England was a grandson of William the Silent. Consult Motley's *Rise of the Dutch Republic* and Harrison's *William the Silent.* See HOLLAND, PHILIP II and SPAIN.

William and Mary College, second in age only to Harvard among American colleges, was chartered in 1693 and is at Williamsburg, Va. It started with an endowment of lands and funds, was the richest college in America in 1775, but lost the bulk of the endowment after 1775 and closed in 1781. The college was reörganized after the Revolution, Virginia granting land to it and Washington serving as chancellor during 1788–9. Until 1819 the college was the surveyor, first of the colony, then for the state, and among the surveyors it appointed were Washington and Jefferson. In 1776 Phi Beta Kappa was founded by Jefferson at William and Mary; in 1779 the elective system was partly introduced, the first in the United States; and William and Mary also was the first college to introduce the honor-system among students. The college has always included history and political science among its studies, being the first in America to found chairs of law and history. Among its graduates were Chief-Justice Marshall, Edmund Randolph, General Winfield Scott and Presidents W. H. Harrison, Jefferson, Monroe and Tyler, the last becoming chancellor. During 1862–8 the college was closed, as also during 1882–7. In 1869 the college reöpened, and again in 1888. The courses of study consist of the collegiate and the normal course. The first is an elective course that groups the elective studies. The second is two years long, but Whaley School adds a year of practical work to the normal course. The state annually appropriates $25,000 to the college. In 1907 the faculty numbered 25, the students 235, the library 15,000 volumes. The college is undenominational.

Will'iams, Sir **George,** founder of the Y. M. C. A., was born at Dulverton, Somerset, England, on Oct. 11, 1821; and was converted at Bridgewater in 1837. In 1841 he became an assistant in a dry-goods firm in London, where he was struck with the neglected condition of the young men. In 1843 he induced some of the employees to hold prayer-meetings at regular intervals, and in June, 1844, Williams and eleven other persons formed themselves into a society under the name of the Young Men's Christian Association (*q. v.*), "a society for improving the spiritual conditions of young men engaged in the drapery and other trades." This society spread rapidly; in 1851 associations were formed in New York, Boston, Philadelphia and Montreal. From 1863 to 1885 he was treasurer of the organization; he then became president. He also became head of the firm of Hitchcock, Williams and Company, and in 1894 was knighted. He died on Nov. 6, 1905.

Williams, John, a noted English missionary, was born at Tottenham, near London, June 29, 1796. He was trained as an iron-monger, but in 1816 went as a missionary to the South Sea islands. After learning the native language by a short stay at Eimeo in the Society Islands, he made his headquarters at Raiatea. His success as a missionary here and elsewhere was remarkable. The people rapidly became Christians, and adopted many civilized habits. Williams traveled unceasingly among the various islands, planting stations and settling native missionaries, whom he himself had trained. From the Society Islands he visited the Hervey group, where he discovered the island of Raratonga. Most of the people of the group were converted in a remarkably short time, and Williams' influence over them was very great. At their request he drew up a code of laws for their government. At Raratonga he built himself a ship with the help of the natives, and with this he made voyages to Samoa and other islands. In 1834 Williams came back to England, and printed his translation of the New Testament into Raratongan. Four years afterwards he went back to the Pacific, and while visiting Erromango, one of the New Hebrides, was murdered by the natives on Nov. 20, 1839. Consult Ebenezer Prout's *Memoir of John Williams.*

Williams, Roger, born in Wales probably in 1607, was one of the founders of Rhode Island. In early life he left his home and went to London. Here his skill as a reporter gained him the patronage of Sir Edward Coke, who sent him to the famous Charterhouse School and then to one of the universities. He next studied law, but, changing his mind, became a clergyman. On account of his Puritan beliefs he left England and reached Massachusetts Bay in 1631. He preached for some years at Plymouth and at Salem. Chiefly on account of his strongly expressed opinion that the government should have no control of religious matters, he was exiled from the Massachusetts colony at Boston. In January of 1636 he left with a few followers for Narragansett Bay. At first the band settled on the site of Seekonk, Mass. But in June Williams and five others embarked in a canoe for Rhode Island and founded a settlement, to which Williams, in remembrance "of God's providence to him in his distress," gave the name of Providence. He went to England in 1643 and next year obtained a charter for the colony, of which he was made deputy president in 1649. In 1651 he made a second voyage to England in behalf of the settlers and spent three years there, during which he enjoyed the friendship of Milton, Cromwell and other leading Puritans. From 1654 to 1658 Williams was governor of the colony. He died in March of 1684.

Williams, Samuel Wells, the historian of China, was born at Utica, N. Y., on Sept. 22, 1812. After studying at Rensselaer Institute at Troy, he went to Canton in 1833 as a printer in the employ of the American Board of Foreign Missions. In 1853 he acted as interpreter to Commodore Perry's expedition, which opened Japan to the world. As secretary of legation at Pekin he was of great help in making the treaty of 1856 between China and the United States. In 1876 he became lecturer on Chinese at Yale College. He published several valuable Chinese dictionaries and textbooks, but is best known by *The Middle Kingdom*, which is held both in America and in Europe to be an authority on Chinese history, life and manners. Professor Williams died at New Haven, Conn., Feb. 17, 1884. Consult F. W. Williams *Life* of him.

Williams College, a Congregational college for men, is at Williamstown, Mass. It was founded as a free school in 1785 by the bequest of Ephraim Williams, a soldier of Massachusetts in the French and Indian War, who had been killed 30 years before near the head of Lake George. The school opened in 1791, and incorporated as a college in 1793. In 1806 a student of Williams, named Mills, held a prayer-meeting with some fellow-students that resulted years later in the founding of the American Board, — the first society in the United States for missions to pagan countries. In 1854 the graduates of the college erected a monument to Col. Williams at the spot where he fell, and in 1906 another was put up at Williams College itself to commemorate the students' meeting that has become known as the Haystack Prayer-Meeting. In 1836 Mark Hopkins (*q. v.*) of whom Garfield in effect said that he was a university in himself, became president, and during his administration the little college entered on a career of prosperity that has never ceased. Courses of study are arranged in the groups of language, philosophy and science. During the first year of the four-year courses the studies largely are required studies. Those of the remaining years are elective studies, but in each group the student must choose a set quantity of study in each group and a major course. There are 77 scholarships, one being a special prize. In 1911 the faculty numbered 57, the students 543 and the library 59,600 volumes. The productive funds amounted to $1,455,304, and the income was $170,555.

Will'iamsburg, Va., county-seat of James City County and formerly the capital of Virginia, is about 50 miles southeast of Richmond and as far from the entrance to Chesapeake Bay. It is built on high ground on the tongue of land between James and York Rivers. Here is the eastern insane asylum of the state, opened in 1773, the oldest institution of the kind in America The Episcopal church was built in 1678. The town, which was named after William III, was ordered built by the Virginian general assembly in 1699, and in 1700 the seat of government was moved here from Jamestown. The capital was changed to Richmond in 1780. Williamsburg is noted as the seat of the College of William and Mary (*q. v.*), walls of which, dating from 1693, still stand. Williamsburg, besides its wealth of history, is quite a progressive center of business. Population 2,500.

Will'iamsport, Pa., county-seat of Lycoming County, on the west branch of the Susquehanna, 95 miles northwest of Harrisburg. The postoffice, city-hall, Williamsport Hospital, Home for the Friendless and the Masonic Temple are among the principal public buildings. The leading educational institutions are Dickinson Seminary, two parochial schools (R. C.), two commercial colleges, 14 public grade-schools and a high school. Of its public schools the city feels justly proud. Williamsport is the center of Pennsylvania's lumber-trade, and in the spring the west branch is filled with pine and hemlock logs. It has large and rapidly growing manufactures, the most prominent being woodworking machinery, furniture, wire-ropes, nails, band-instruments, radiators and power-transmission machinery. The city was settled in 1797. Population 31,860.

Will'iamstown, Mass., 5 miles west of North Adams and 40 east of Troy, N. Y., is on the Fitchburg (Boston and Maine) Railroad. It nestles among the famous Berkshire Hills, and is the seat of Williams College (*q. v.*). Population 5,013.

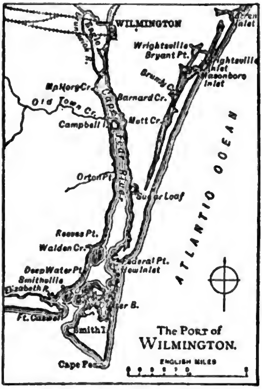
Willimantic (*wĭl'ĭ-măn'tĭk*), **Conn.,** a city in Windham County, at the junction of Willimantic and Natchaug Rivers, 35 miles from Hartford. Within the limits of the city the Willimantic falls 91 feet, and affords excellent waterpower. The important manufacturing industries are thread and silk mills, cotton-warp mills, a spool-factory, silk-machinery works, print-factories and foundry and machine shops. In the city are parochial and public schools, a high school, a public library containing about 6,000 volumes, Dunkirk Hall Library and a state normal school. Willimantic was incorporated as a borough in 1833, and chartered as a city in 1893. It has the service of the Central Vermont and New York, New Haven and Hartford railways. Population 11,230.

Wil'lis, Nathaniel Parker, was born at Portland, Me., Jan. 20, 1806. He graduated at Yale College in 1827, and in the same year published *Poetical Sketches*. He wrote for the magazines, and in 1829 started *The American Monthly Magazine* After its death in 1831, he traveled in Europe, recording his saunterings in *Pencilings by the Way*, which with its lifelike and rapid sketches of Old-World scenes at once gained wide popularity. These pencilings were contributed to *The Evening Mirror* of New York City, for which Poe also wrote. In 1839 appeared *Letters from Under a Bridge*, the most charming of Willis's books Others of the best of his writings are tales and sketches, as *F. Smith*, *The Ghost-Ball at Congress Hall* and his simpler poems, like *Unseen Spirits*, *Spring* etc. Willis died on Jan. 20, 1867. Consult Henry A. Beers' *Life*.

Wil'low, a class of trees of the same family as the poplar. Willows vary in size from those of the Alps, which are an inch or two high, to trees of from 50 to 80 feet. They are found in most countries, with the exception of Australia; rival the birch in wandering far northward; and in the New World are found as far south as Chile. The catkins, usually yellow, appear before or with the leaves, stamen-bearing flowers on one tree, pistil-bearing ones on another. The flowers are rich in honey, and so are prime favorites with bees. Willows scatter their seeds prodigally; and their twigs and branches take root readily and grow rapidly. The trees have many and large roots, which grow a long distance through moist soil and bind it with a network of fibers, thus preventing the banks of streams from being worn away. The bark is tough and bitter, charged with salicylic acid. It is used for making fishnets, ropes, tan-bark and sometimes, in Norway and Sweden, for mixing with oatmeal. The wood is used in houses, vessels, farm-tools and casks; as fuel; and for charcoal. The twigs and young shoots are used in making baskets and light furniture. Willow leaves show a great variety of greens, ranging from a yellow to a blue green; they grow on short stalks one by one along the twigs. There are some 60 North American willows, ten of which are not found elsewhere. The most important of all kinds is the white willow, common throughout Asia, Europe and America. It sometimes reaches the height of 80 feet. It is very useful on the prairies, as it is a fast grower and also protects other trees from the wind. Other kinds are the golden osier or yellow, the blue, brittle, varnished and green willows. Very ancient is the use of willow-withes in the making of ropes and baskets. To-day the willow-ware industry is receiving increasing attention. The wood is light-colored and light in weight. Its charcoal is preferred above others for gunpowder. The weeping willow, a native of Asia and North Africa, has been introduced into America, and the drooping, supple branches are generally familiar. It grows to a large size and a great age. The tree is frequently planted in cemeteries. It is a favorite in China, and has a prominent place in Chinese pictures. A famous weeping-willow marks Napoleon's empty grave at St. Helena. In olden days the wearing of the willow was sign of despairing love. The pussy-willow is common in the United States. Usually it is but a shrub. It bears well-known, silky, white catkins, which, appearing so early in spring, are eagerly hailed as vernal heralds. Gall-insects work much harm on the willows, and gall-growths are often found on twig and leaf.

Wil'mington, Del., the county-seat of Newcastle County and the largest city in the state, is on Delaware River, 28 miles southwest of Philadelphia. The city stands on hilly ground between Brandywine and Christiana Creeks, and slopes toward the Delaware, which is not yet reached by the built-up part of the city. At this point, 65 miles from the ocean, the Delaware is three miles wide, with 30 feet of water at mid-tide in its shallowest parts. The city maintains a park system of 405 acres. The principal buildings are the government building, courthouse, city hall, Y.M.C.A. and Y.W.C.A., the Du Pont office building and hotel, the Peoples' Settlement, St. Peter's Orphanage for Girls, St. Joseph's Home for Colored People, two homes for the aged, and three hospitals. The city annually expends $300,000, on its 31 schools, which have 345 teachers and 12,237 pupils. Other educational institutions are Hebb's School, Wilmington Friends' School, Ursuline Academy, Goldey College and Beacon Business College. The city has a central library and two branch libraries. The Swedish church, founded in 1698, received funds from William Penn, a bible from Queen Anne and a communion service from the miners of Sweden. Among the larger manufacturers are the famous E. I. Du Pont & Co., the Hercules and the Atlas Powder Companies, the Harlan & Hollingsworth Corporation, the Jackson & Sharp plant of the American Car & Foundry Company, the Pullman Company, and the Pennsylvania Railroad Company's plants, besides numerous other factories, including the building of steel and wooden ships, specialized machinery, machine tools and rubber hose. Wilmington was founded in 1732 on the site of the first Swedish settlement in 1638. Population, 100,000.

Wilmington, N. C., capital of New Hanover County, the largest city and chief port of North Carolina, is on Cape Fear River, 20 miles from the sea and 110 southeast of Raleigh. It is a railroad center, and its wharves are kept busy with a large coastal and foreign trade. Steamers run to Baltimore, Philadelphia and New York. The chief exports are lumber, turpentine, rosin, tar, pitch, shingles and cotton. The manufacturing industries consist of these articles and of the manufacture of men's clothing, wagons, carriages and cotton, foundry and machine products. Among the prominent public buildings are the county court-house, city-hall, Masonic Temple, three hospitals, the United States Marine Hospital, two charitable institutions and 33 churches. There are public and parochial schools, and the city also contains Cape Fear Academy, Alderman's School, the Academy of the Incarnation (R. C.) and Gregory Normal School (colored). Wilmington was first called Newton, and was founded in 1733. During the Civil War it was a noted port for blockade runners until the capture of Fort Fisher at the mouth of Cape Fear Inlet by General Terry in January of 1865. In February of the same year General Schofield forced the Confederates to abandon Wilmington. Population 25,748.



Wil'son, Alexander, an American naturalist, was born at Paisley, Scotland, July 6, 1766. He was a weaver and peddler, and at 24 published a volume of poetry. In 1794 he reached Newcastle, Del., with but a few borrowed shillings in his pocket. While peddling through New Jersey he began to study the habits of birds, and after teaching some years he determined to form a collection of American birds. His first trip was made in 1804 through the unbroken wilderness of western New York to Niagara Falls. He gave an account of this journey in his poem of *The Foresters.* His position of assistant-editor of *Rees' Cyclopædia* gave him more means and time for his undertaking, and, when the first volume came out in 1808, he spent some months in tramping, "looking for birds and subscribers." He sailed down the Ohio to Louisville, and rode on horseback from Nashville to New Orleans. He made another tour of the eastern states in 1812. He had, however, overworked himself in preparing his book, and lived only to finish seven volumes. Two more were edited by George Ord, who had accompanied him on some of his journeys, and the work was carried further by Charles Lucien Bonaparte. Wilson was the first to make a careful study of American birds, and his great work on *American Ornithology* is a scientific classic. The author died at Philadelphia, Aug. 23, 1813. Consult *Difficulties Overcome* by C. Lucy Brightwell.

Wilson, Sir **Daniel,** a Scoto-Canadian educator and archæologist and from 1881 to 1892 president of Toronto University, was born at Edinburgh in 1816. Famous "Kit North" was his brother. In 1853 he was appointed professor of history and English literature in University College, Toronto, succeeding to the presidency in 1881. His writings embrace *Prehistoric Man; Prehistoric Annals of Scotland; Memorials of Edinburgh; Caliban the Missing Link;* and a study of *Chatterton.* He was knighted in 1888, and died at Toronto, Aug. 7, 1892.

DANIEL WILSON

Wilson, Henry, eighteenth vice-president of the United States, was born at Farmington, N. H., Feb. 16, 1812. His proper name was Jeremiah J. Colbaith, which at 21 he changed for some unknown reason to that of Henry Wilson. His father was a day-laborer, and poor. When ten years old, the boy went to work as a farm-hand. He was greedy for reading, and before the end of his apprenticeship had read more than a thousand volumes. He then walked to Natick, Mass., and learned the trade of shoemaker, by which he paid his way through Concord Academy. After setting up as a shoe-manufacturer he became a noted public speaker in support of Harrison in the campaign of 1840. For the next ten years he was regularly elected to the legislature of Massachusetts. In 1848 he left the Whig party and became a Free-Soiler. In 1853 he was defeated for governor on the Free-Soil ticket, but two years later was made Sumner's colleague in the United States senate. Wilson had helped to form the antislavery society; throughout his political life he had earnestly upheld antislavery; and he became one of the founders of the Republican party. In 1872 he was chosen vice-president on the ticket with Grant, but died on Nov. 22, 1875. He left three important historical works: *Antislavery*

Measures in Congress, *Reconstruction Measures in Congress* and *The Rise and Fall of the Slave-Power in America*. Consult Nason's *Life*.

Wilson, James Harrison, American soldier (major-general United States volunteers), was born near Shawneetown, Ill., Sept. 2, 1837, and was educated at McKendree College there and at West Point, where he graduated in 1860. He was assigned to the corps of topographical engineers, serving in the department of Oregon. He was distinguished as an officer of engineers in the Civil War, notably in the Richmond raid and in the operations near Petersburg; in 1864 he commanded the 3d division of Sherman's cavalry and the cavalry corps in the military division of the Mississippi; participated in the capture of Fort Pulaski, took part in the campaigns of Antietam, Vicksburg, Chattanooga and the Wilderness; commanded in the assault and capture of Selma and Montgomery, Ala., Columbus and Macon, Ga., and finally in the capture of Jeff Davis. After the war he was engaged in railroad and engineering operations; and in the war with Spain he commanded the 1st division of the 1st army corps in the campaign in Porto Rico. He is the author of *China; Andrew J. Alexander;* and (with the late Chas. A. Dana) a *Life of General Grant*, and several other lives of men prominent in military affairs.

Wilson, James H., was born in Ayrshire, Scotland, Aug. 16, 1835. He came to the United States in 1852, and settled in Norwich, Conn., with his parents. In 1855 he moved to Tama County, Iowa, where in 1861 he engaged in farming. He was a member of the 12th, 13th and 14th assemblies of Iowa, of the last of which he was speaker. He was the state's railway commissioner and a member of Congress during 1873-7 and 1883-5. From 1870 until 1874 he was regent of the University of Iowa. From 1890 until 1897 he was director of the Iowa Agricultural Experiment-Station, and for a time he was professor of agriculture at Iowa Agricultural College. He was awarded the degree of LL. D. by the University of Wisconsin in 1904. In 1894 he was appointed Secretary of Agriculture by President McKinley, and was retained by Roosevelt and Taft.

Wilson, John, famous as the "Christopher North" of *Blackwood's Magazine*, was born May 18, 1785, at Paisley, Scotland, where his father was a rich manufacturer. Sir Daniel Wilson (*q. v.*) of Canada was his brother. After being privately tutored, he spent four years at Glasgow University and then four more at Oxford, where he led both in scholarship and in athletics. On leaving Oxford he settled in the beautiful lake-country of Cumberland, where he soon became a close friend of Wordsworth, Southey, Coleridge and De Quincey, and amused himself by measuring his strength against that of the far-famed Cumberland wrestlers, the very sturdiest of whom said that he was "a vera bad un to lick." After writing his first two poems, *Isle of Palms* and *The City of the Plague*, most of his fortune was lost through the rascality of a relation, and Wilson went to Edinburgh and became a lawyer. In 1817 *Blackwood's Magazine* was founded, for which, during its earlier years, Wilson and Lockhart, his friend, were the writers who gave it its success. In 1820 Wilson was made professor of moral philosophy in Edinburgh University. Here he had almost unexampled power of rousing the enthusiasm of his students. He, however, cared little for dignity, and on more than one occasion the professor of moral philosophy took off his coat in the public market-place to punish some ruffian. The amount of his writings in *Blackwood's* was enormous; from this mass he selected and published *The Recreations of Christopher North* (1842). The power of his genius is best seen, perhaps, in the series of table-talks called *Noctes Ambrosianæ*. As a writer and a man the Scotch idolized him almost as much as they did Burns and Scott. He died at Edinburgh, April 3, 1854. Consult the *Memoir* by Mrs. Gordon, his daughter.

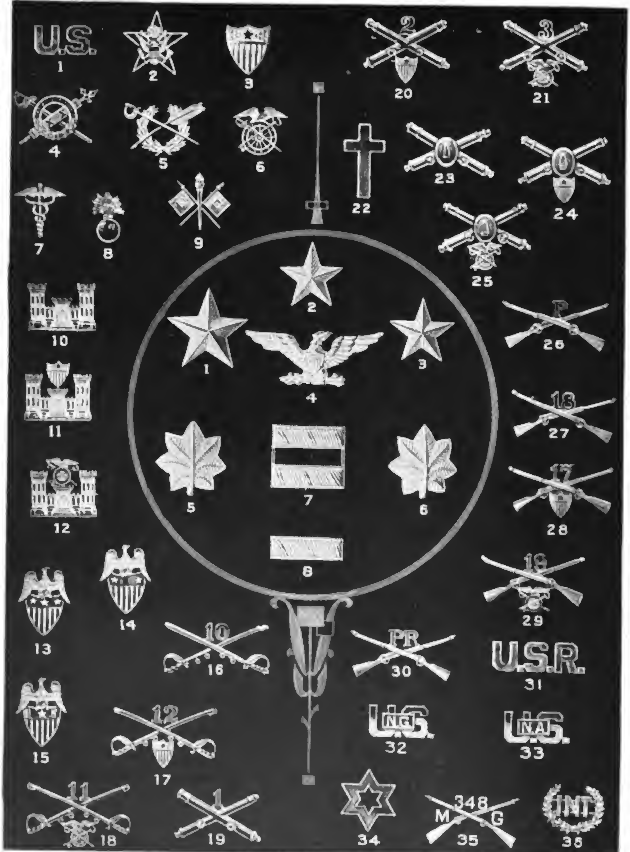
Wilson, William Lyne, LL.D., American statesman and late president of Washington and Lee University, was born in Jefferson County, Va., May 3, 1843, and died at Lexington, Va., Oct. 17, 1900. After an education at Columbian College (D. C.), and at the University of Virginia, he served for a time in the Confederate army, subsequently becoming a professor of Latin in Columbian College and president of West Virginia University. He also studied and practiced law, and from 1883 to 1895 was a member of Congress, regent of Smithsonian Institution and president of the national Democratic convention of 1892. Between 1895 and 1897 he was postmaster-general of the United States, and in the latter year he accepted the presidency of Washington and Lee University. While in Congress, he drafted the bill for the revision and reduction of tariff-duties, known as the Wilson tariff-bill. See Tariff.

Wilson, Woodrow, twenty-seventh President of the United States, was born in Staunton, Va., Dec. 28, 1856. Graduating from Princeton in 1879, he studied law at Virginia University and practiced in Atlanta, Ga. Before entering the service of his alma mater, first as professor of jurisprudence and politics, and, later, as president, he had held professorships at Bryn Mawr and Wesleyan. His college career was distinguished not only by rare scholarship and capacity as a teacher, but for unusual executive ability and his

WOODROW WILSON

Photo © Moffet

INSIGNIA OF ARMY OFFICERS



Central circle insignia show officer's rank. Badges in outside space show to what division of the service he belongs. Rank insignia: 1. Lt. General 3 stars (silver). 2. Maj. General 2 stars (silver). 3. Brig. General 1 star (silver). 4. Colonel (silver). 5. Lieut. Colonel (silver). 6. Major (gold). 7. Captain (silver). 8. 1st Lieut. (silver). 2nd Lieut. (gold). Badges indicating character of service: 1. All officers. 2. General Staff. 3. Adjutant General's Dept. 4. Inspector General's Dept. 5. Judge Adv. General's Dept. 6. Quartermaster Corps. 7. Medical Corps. 8. Ordnance Department. 9. Signal Corps. 10. Corps of Engineers. 11. Corps of Engineers, Adjt. 12. Corps of Engineers, Quartermaster. 13. Aids of Lieut. General. 14. Aids of Major General. 15. Aids to Brig. General. 16. Cavalry. 17. Cavalry Adjutant. 18. Cavalry Quartermaster. 19. Field Artillery. 20. Field Artillery. Adjt. 21. Field Artillery. 22. Chaplain. 23. Coast Artillery. 24. Coast Artillery. Adjt. 25. Coast Artillery. Quartermaster. 26. Infantry. Philippine Scouts. 27. Infantry. 28. Infantry. Adjt. 29. Infantry. Quartermaster. 30. Infantry. Porto Rico Rgt. 31. Officers. U. S. Reserve Corps. 32. Officers. National Guard. 33. Officers. National Army. 34. Chief of Staff or Assistant Chief of Staff. 35. Officers Machine Gunners. Upper figures (as 348) designate battalions or regiments. 36. Officers (Corps of Interpreters).

successful determination to make the University more democratic. His capacity for larger public service was so evident that he was induced to run for governor of his state, and in that office established important legislative reforms in opposition to the "machine" element of his party. His distinguished record as governor indicated him as the logical candidate of the reform element of his party, and aided by the powerful support of Mr. Bryan, he was nominated at the Convention of 1912. Out of 544 electoral votes cast he received 435. In 1916 he was renominated. The Republicans nominated Charles Evans Hughes (*q. v.*) but President Wilson was re-elected, although the vote was so close that the result was not known until several days after the election. As a historian and writer on political and economic questions, Wilson occupies a distinguished position. His writings embrace *George Washington; Congressional Government; a Study in American Politics; The State; Elements of Politics; Division and Reunion;* and *History of the American People.*

Win'chell, Alexander, a distinguished American geologist and author, was born in North East, New York, Dec. 31, 1824, and died at Ann Arbor, Mich., February 19, 1891, where he occupied the chair as Professor of Geology and Paleontology in the university. He first entered the university service in 1854 as Professor of physics and civil engineering. His published writings embrace *Sketches of Creation, The Doctrine of Evolution, The Geology of the Stars, Reconciliation of Science and Religion, Pre-Adamites, Sparks from a Geologist's Hammer, World-Life: a Comparative Geology, Geological Excursions* and *Geological Studies.*

Winchester, England, famous as the site of Winchester Cathedral, is picturesquely situated in the valley of the Itchen, sixty-six and a half miles from London. Winchester Cathedral, which is in the lower part of the city, is not comspicuous from a distance, only its low central tower being visible. On the outside the cathedral is very plain but within it is extremely imposing. One of its most striking features is its great length. Tradition says that the original building was erected in the second century, but the present cathedral is the work of the Normans in the latter part of the eleventh century. Winchester is also famous as an educational center, the seat of Winchester College.

Win'chester, Ky., county-seat of Clark County, on the Chesapeake and Ohio, Louisville and Nashville and Lexington and Eastern railroads, 18 miles east of Lexington. It is the seat, dating from 1866, of Kentucky Wesleyan College (Methodist Episcopal South), while the city dates from 1792 and is in a good farming country. Its chief industries include the manufacture of furniture, carriages, spokes and rims, overalls, gasoline engines, confectionery and planing-mill products. Population 7,156.

Winchester, Mass., a town in Middlesex County, on the Boston and Maine Railroad, eight miles northwest of Boston, of which it in large degree is a suburban residence with a fine system of parks. Settled early in the 17th century, it has been known successively as Waterfield, Charleston Village, Woburn and, finally, as Winchester. Besides a state aviary and a Home for the Aged, it has a well-equipped public library. Its industries embrace machinery of various kinds, felt and leather goods, watch-hands etc. Population 9,309.

Winchester, Va., county-seat of Frederick County, on the Baltimore and Ohio and Cumberland Valley railroads, about 75 miles west-northwest of Washington. Historically it is noted for its importance in the Revolutionary and the Civil War. It possesses a number of educational institutions, including Valley Female College of the Methodist Episcopal Church South; and it has National and Confederate cemeteries in the neighborhood. Besides its farming, lumbering and stock-raising, it is noted for its glove, leather, woolen, flour and paper works, besides bark-mills and an ice-plant. Population 5,765.

Wind'mill'. Windmills vary in diameter, the largest in ordinary wind developing as high as four H. P. The ordinary pumping-wheel develops less than one quarter H. P. For service requiring small power, and where constant operation is not vital, as in pumping water, and grinding feed, windmills are the cheapest power available. American windmills practically control the market all over the world. Windmills have been in use since the twelfth century in Europe. The old-fashioned mill still in use in Holland has its arms covered with canvas, and the diameter of the wheel is generally very large. These wheels are largely used for pumping water and for grinding grain. They have various schemes for setting them to face the wind, a common method in Germany being to rotate the whole tower on wheels. In American windmills, the direction of the wheel is regulated by an arm carrying a vane. Windmills are unsuited to driving dynamos on account of the variation in speed.

Win'dom, William, an American politician and financier, was born at Waterford, Ohio, on May 10, 1827. After being admitted to the bar, he went to Minnesota and entered politics as a Congressman in 1858. He was regularly reelected for ten years, and was in his second term as United States senator when, in 1881, he was appointed secretary of the treasury in President Garfield's cabinet. On Garfield's death he resigned and was at once sent back to the senate, having in the short time that he held his secretaryship gained the reputation of being a worthy successor of Hamilton, Gallatin and Sherman. In 1889 he was again made secretary of the treasury in President Harrison's cabinet, but died at New York, Jan. 29, 1891.

Win'dow, an opening in the wall of a building to admit light and ventilation. Windows were practically unknown among the Greeks and Romans; at least, the few windows used were mere holes in the sides of the building. Even among the Anglo-Saxons a window carried with it no association of glass as it does to us, for the early windows in England were merely covered with stretched hide or filled with lattice-work. The Anglo-Saxon word for window is *eagdura*, that is, an eye-door; and our word for window is a compound of *wind* and *eye*. Even as late as the discovery of America, 1492, windows were enormously expensive. Consult Traill's *Social England*, Vol. II., p. 572. It is only since the days of cheap glass that the luxury of windows, as we now understand them, has been enjoyed by every one.

Winds are currents in the earth's atmosphere, produced by disturbances which result from differences of temperature in different parts of the country. Thus the air in contact with heated ground becomes heated itself and rises to the upper regions, thus diminishing the barometric pressure in that locality. Accordingly the air flows in from neighboring regions where the barometric pressure has not been diminished, and this current is what is known as a wind. Winds have received various names, according to their velocities and their characteristics. Thus a barely perceptible wind moves from one to two feet a second; a moderate breeze from 10 to 20 feet a second; a fresh breeze from 20 to 30 feet a second; a strong breeze from 30 to 55 feet a second; a storm from 55 to 90 feet a second; a hurricane from 90 to 120 feet a second.

Regular winds are those which blow always in the same general direction. Such are the trade-winds (*q. v.*).

Periodical winds are those which recur at regular intervals. Among these may be mentioned the land and sea breezes of the seashore; the *sirocco* of Algeria, a wind which blows from the Sahara etc. Most of our winds are *variable*. See CYCLONE, MONSOON, STORM, and TRADE WINDS.

Wind'sor Castle, the chief home of the English sovereigns, is at Windsor, a town on Thames River, 21 miles from London. As early as the time of the so-called heptarchy (*q.v.*) there was a stronghold there. Henry III built a round tower on the site, but it was wholly rebuilt by Edward III in 1342 as a meeting-place for his newly established order of the Knights of the Garter. He chose this spot because of the popular story that King Arthur used to sit here surrounded by his Knights of the Round Table. Henry III built many of the present walls and towers and two chapels, one of which Henry VIII gave to Cardinal Wolsey, who had a costly tomb erected there, and the chapel for a long time after was known as Wolsey's tomb-house. It is now called Albert Memorial Chapel. The magnificent chapel of St. George ranks next to Westminster Abbey as a royal burying-place. Among the many treasures in the royal library are a fine collection of drawings by the chief Italian painters and a series of 87 portraits, by Holbein, of Henry VIII's court. The royal forest of Windsor is one of the finest in England.

Windsor, Ont., Can., on Detroit River opposite Detroit. It has daily communication in summer with all lake-ports and ten-minutes' ferry-service to Detroit. It is the western terminus of the Grand Trunk, of the Ontario and Quebec division of the Canadian Pacific Railway and of the Canadian divisions of the Michigan Central and Wabash Railways. A tunnel under the river has been constructed for trains *via* the Michigan Central across Ontario. Population, 17,534.

Wind'ward Islands, the southern part of the Lesser Antilles, consist of Grenada, the Grenadines, St. Lucia and St. Vincent. They form the eastern barrier, from Martinique to Trinidad, of the Caribbean Sea. Each island has its own institutions, but they have a mutual court of appeals and unite for other purposes. Their area is 1,008 square miles; and population about 180,000. They belong to Great Britain. See WEST INDIES.

Wine, the fermented juice of grapes. For winemaking, grapes are usually picked dead-ripe and sometimes are even allowed to wither, while some wines are made from raisins, and champagne and other kinds from grapes not quite ripe. In making the best wines great care is taken with the grapes, the unripe or faulty berries being picked off the bunches by hand and only the best bunches used. The grapes are put into the winepress, a large tub, and the juice pressed out by treading with the naked feet; or mechanical presses are used for this purpose. The juice runs through holes in the bottom of the press into a vat where it is left to ferment, this process lasting from a few hours to several days. This fermentation or "working" changes the sugar of the juice or "must" into alcohol and throws off carbonic acid gas. When the must has stopped frothing and become clear and cool, it is drawn off from the vat, or "racked," and put into casks, where a second fermentation takes place. In sweet wines or liquors not all the sugar is changed into alcohol; when all or most of the sugar is so changed, the wine is called dry wine. When wines are bottled before fermentation is finished, they contain carbonic acid gas, which causes them to foam when uncorked. This gives the sparkle to champagne and other wines. The color of wine comes from the skins, white grapes yielding an amber-hued wine, dark grapes the rich color of claret and port. Logwood, burnt sugar etc. are also used to color wine. In the middle ages most of the wine drunk in Europe came from the Greek islands which grew the famous malmsey. Later the Rhine wines of Germany and the Burgundy wines of France became noted, and then began the vine-culture and wine-trade that have spread all over those countries. Their chief wines now are Bordeaux or claret, champagne, Burgundy, Hockheim and Moselle. The finest of the Hungarian wines is Tokay. Spain furnishes the sherry wines and Portugal port. One of the best of the many Italian wines is *Lachrymæ Christi*. Madeira has long been famous for its fine white wine. The Californian wines are the best in the United States, and amount to two thirds of the yearly output of the country. In 1906 the United States consumed 46,485,223 gallons of wine. In one year the world's estimated total production of wine was over 3,160 million gallons — France, Italy and Spain furnishing the bulk of this quantity.

Win'field, Kans., county-seat of Cowley County, on Walnut River and on the Atchison, Topeka and Santa Fé; St. Louis and San Francisco; and Missouri Pacific railroads, about 40 miles southeast of Wichita and 220 southwest of Kansas City. It is in a farming and stock-raising region, where there also is natural gas. Here are the Kansas Imbecile Asylum, St. John's College (Lutheran) and Southwestern College (M. E.). Winfield dates from 1870, and its industries include a wholesale grocery, produce-packing plants, flour mills and grain elevators. Winfield enjoys the unique distinction of having won the prize as the best town in Kansas in which to rear children. Population, 7,200.

Winkelried (*vĭn'kĕl-rēt*), **Arnold von,** a hero of Switzerland, the story of whose exploit is, after that of William Tell, the most popular in the early history of the Swiss. We are told how, at a critical moment in the great battle of Sempach, when the Swiss had failed to break the serried ranks of the Austrian knights, a man of Unterwalden, Arnold von Winkelried, came to the rescue. Entrusting his wife and children to the care of his comrades, he rushed toward the Austrians, gathered as many of their spears as he could against his breast, and fell pierced through and through; but into the gap thus made rushed the Swiss mountaineers and routed the Austrians. By the battle of Sempach (July 9, 1386) Switzerland gained its freedom.

Win'neba'go Lake, the largest in Wisconsin, is 28 miles long from north to south and about ten wide, and covers about 212 square miles. It is navigable, as is also Fox River, which carries its waters to Green Bay and Lake Michigan. For 15 miles along the eastern shore extends a rock-wall, in some places reaching hundreds of feet below the surface. Fond du Lac and Oshkosh border it.

Winnebagoes, a tribe of Indians belonging to the Dakota family, whose name means Men from the Salt Water. The French traders found them a large tribe in the Green Bay region of Wisconsin, and ruling over the neighboring Algonquin tribes. But in the beginning of the 17th century several banded tribes cooped them into one town, where 500 warriors died of want and sickness. The Illinois next attacked them, and at the end of the war the Winnebagoes were only a small tribe. They fought with the French against the English and with the British against the Americans. They were conquered by Gen. Anthony Wayne, and were among the tribes banded together by Tecumseh. They ceded their land in parcels, beginning in 1829. By 1846 they had been removed from Wisconsin, except a few who had taken allotments of land. After being sent to reservations in Iowa, in Minnesota and in Dakota, they were moved to Winnebago, Nebraska, and given in charge of the Quakers, who, as well as the Roman Catholics and the Presbyterians, established missions among them. They number about 2,000.

Win'nipeg, a large lake in Manitoba and Keewatin, about 260 miles long and six to 60 wide and covering about 8,500 square miles. It stands 628 feet above the sea; drains about 400,000 square miles; receives the waters of Lakes Manitoba and Winnipegosis, of the Lake of the Woods and of Red, Berens and Saskatchewan Rivers. It discharges its own waters through Nelson River into Hudson Bay. In winter the ice sometimes is five feet thick, and in the upper part does not disappear till June.

Winnipeg, Can., capital of Manitoba (*q. v.*) stands at the confluence of Assiniboine and Red Rivers. It practically is the gateway to the west of Canada, and is a metropolis of great promise. It originated in 1738 in Fort Rouge, which was followed in 1804 by Fort Montreal, in 1812 by Fort Douglas and in 1822 by Fort Garry. Colonization began with Fort Douglas, when the Scotch highlanders of Lord Selkirk founded a farming settlement on Red River. Fort Garry became the seat of government, and half a mile away grew up the village of Winnipeg. This was incorporated as a city in 1873, and covers the site of the old forts. Winnipeg is on the Canadian

Pacific, half way from Montreal to Vancouver, and also on the Canadian Northern. The first of these railways has six, the second four, branches to various points in Manitoba and the provinces adjoining. The Grand Trunk Pacific also makes Winnipeg its central point. There is steam navigation down Red River and up the Saskatchewan to the Rockies, 1,000 miles.

Winnipeg is the commercial metropolis of western Canada and the center of its jobbing and wholesale trade. It also is the financial headquarters. It exports more wheat than Duluth, Minn., and Chicago, Ills. The Saint Andrew water-power on Red River and the Bonnet electric power-plant on Winnipeg River are making it a manufacturing center. Among the manufactures of the city are flour and oatmeal; bookbinding; clothing; brewing; furniture; harness and saddlery; carriages and wagons; soap, tanning and wooden goods; and many minor products. The city owns its asphalt plant, electric lighting plant, a quarry and waterworks, and has many fine parks and magnificent boulevards. The public buildings, among which should be mentioned those of the Manitoba legislature and the residence of the lieutenant-governor, would do credit to London. The school-buildings, numbering over 20 and costing $750,000, are unsurpassed in appearance and use. The Roman Catholics of the city also have parochial schools. Collegiate Institute, Manitoba Normal School, Carnegie Library and the University of Manitoba are the prominent institutions of learning. With the last are affiliated a College of Pharmacy, a Medical College, Manitoba College (Presb.), St. Boniface College (R. C.), St. John College (Anglican) and Wesley College (Methodist). The churches number 70, Winnipeg being as noted for the many religious bodies represented as for its numerous nationalities. The city has grown from 215 people in 1870 to 135,430 inhabitants at the present time.

Win'nipego'sis, meaning Little Winnipeg, a lake of Manitoba and Keewatin. It is about 125 miles long; its greatest width is 25 miles; and it covers about 2,000 square miles. It is 60 feet higher than Lake Winnipeg and 20 higher than Lake Manitoba, into which it discharges its waters by means of Water-Hen River. The waters of Dauphin Lake and Swan and Red Deer Rivers fall into Lake Winnipegosis.

Winnipiseogee (*win'e-pe-sä'ke*), a lake of New Hampshire, 25 miles long and about ten wide. There are a number of bays and many islands. Winnipiseogee or Winnepesaukee River carries its waters to the Merrimac. Its waters are clear, deep and well-stocked with fish.

Wino'na, Minn., county-seat of Winona County, the fourth city of Minnesota, on the Mississippi, 104 miles southeast of St. Paul. It is built on rich lowlands under the Mississippi bluffs. One of its finest buildings is the state's normal school. It also has a fine government building, a library, Y. M. C. A. and Y. W. C. A. buildings and a waterfront park second to none on the Mississippi. Winona is a large wheat mart, besides which it has manufactures of carriages, wagons, farm-tools, flour, shoes, candies, patent-medicines, a large malting plant and a flax or fiber plant. The city was settled in 1851. Population, 18,583.

Wins'low, Edward, governor of Plymouth Colony, was born at Droitwich, Worcestershire, England, Oct. 19, 1595. He came to New England in the *Mayflower*, and offered himself to Massasoit, the Indian chief, as a hostage for the fair dealing of the colonists. In this way and by curing the chief when he was sick he gained his friendship. After two voyages to England on behalf of the colony, he was made governor in 1633, 1636 and 1644. On his third visit to England (1635) he was imprisoned for 17 weeks by Archbishop Laud for teaching in the church, as he was not a clergyman. Winslow's portrait in the gallery of the Pilgrim Society at Plymouth is said to be the only authentic likeness of any of the *Mayflower* Pilgrims. His marriage with Mrs. Susanna White was the first marriage in Plymouth Colony. In 1655 Cromwell sent Winslow on a mission to the West Indies, but he died on the voyage, May 8, 1655. Consult Justin Winsor's *Narrative History of the United States.*

Winslow, John Ancrum, American admiral, who in 1864, when in command of the *Kearsarge*, defeated and sank the Confederate privateer *Alabama* off Cherbourg harbor, was born at Wilmington, N. C., Nov. 19, 1811, and died at Boston, Mass., Sept. 29, 1873. Entering the United States navy in 1827, he served in the Mexican War and for gallantry was given command of the *Morris* and subsequently promoted to the rank of commander. After his encounter with Captain Semmes and the sinking of the *Alabama* (June 14, 1864), he was promoted to commodore and in 1866-7 commanded the Gulf squadron. In 1870 he received a rear-admiralship, and was given command of the Pacific squadron (1870-2).

Win'sor, Justin, American historian and librarian, was born at Boston, Mass., Jan. 2, 1831, and died at Cambridge, Mass., Oct. 22, 1897. After studying at Harvard and at Heidelberg, he became superintendent of Boston Library and held this post from 1868 to 1877, passing in the latter year to the librarianship of Harvard. From 1876 to 1886 he was president of American Library Association and of the American Historical Association, and was secretary of the Massachusetts Historical Society.

He was a large contributor to the periodical press and an extensive and instructive author. His chief publications embrace *The Readers' Handbook of the American Revolution*, *Bibliography of Original Quartos and Folios of Shakespeare*, *Christopher Columbus*, *Cartier to Frontenac* and *Narrative and Critical History of America*. He also edited the *Memorial History of Boston*.

JUSTIN WINSOR

Wins'ton, N. C., a city and manufacturing center, the capital of Forsyth County, adjoining the city of Salem, in the northwestern portion of North Carolina. It is on the Southern Railroad and the Norfolk and Western Railroad, 27 miles west of Greensboro and 120 northwest of Raleigh. It has a number of tobacco-factories and warehouses, iron-works, cotton and woolen mills, carriage and wagon factories and shuttle and bobbin works. Population of Winston-Salem 17,167.

Win'ter, William, American poet, essayist and dramatic critic, was born at Gloucester, Mass., on July 15, 1836, and in 1857 graduated from Harvard Law School. His tastes inclining him to literature, he abjured law and wooed the Muses, publishing two collections of verse entitled *The Convent* and *The Queen's Domain* and other poems, besides lecturing occasionally. Removing to New York in 1859, he became literary editor of *The Saturday Press* and assistant-editor (1861-5) of *Albion*, and then transferred his pen to *The Tribune* for which he has long been dramatic critic, as well as a writer of literary essays, and a contributor of historical and other articles and addresses and a biographer of actors. His published work is considerable, and ever reveals the practised *littérateur* and a writer of culture and charm. His later volumes of verse include *My Witness*, *Thistledown* and *Wanderers*. Of actors and theatrical folk he has treated in *Henry Irving; The Stage-Life of Mary Anderson; Life and Art of Edwin Booth*; *Life and Art of Joseph Jefferson;* and *Shadows of the Stage*. Other books include *Shakespeare's England*, *Gray Days and Gold* and *Brown Heath and Blue Bells*. He has also edited the work of a number of contemporary players including those of Brougham, Arnold and O'Brien, besides *The Plays of Edwin Booth*.

Winter's Tale, The, is a drama of Shakspere which certainly was acted as early as 1611, although it was first printed in the folio of 1623. The plot of the drama closely follows that of Rob Greene's *Pandosto*, a novel of the type of Lodge's *Rosalind*. The drama is loftier, calmer and maturer than the novel; and skillfully contrasts the nobility and dignity of the unjustly suspected Hermione with the insolence, tyranny and jealousy of Leontes.

Win'throp, John, governor of Massachusetts colony, was born at Groton, Suffolk, England, Jan. 12, 1587. He became a lawyer, and because of his good and religious character he was chosen governor by the Massachusetts Bay Company in 1629. The next year he came over, bringing 900 emigrants. He was generally re-elected every year throughout his life, except from 1634 to 1636, when he was deputy under Sir Harry Vane. His influence in the colony was very great, and through it on the life, thought and later politics and institutions of New England. Winthrop's *Journal* is one of the most important sources of early American history. John, his son, was governor of Connecticut. Governor Winthrop died at Boston, March 26, 1649.

Winthrop, Theodore, an American author, was born at New Haven, Conn., Sept. 22, 1828. He graduated at Yale College in 1848. He then entered business in New York, spent two years at Panama and opened a law-office at St. Louis. On the outbreak of the Civil War he enlisted, and was one of the earliest martyrs of the struggle, being shot while leading a charge at Big Bethel, June 10, 1861. He was hardly known as a writer till the appearance in *The Atlantic Monthly* of his lifelike sketches of *Washington as a Camp*, describing the march of his regiment, the famous New York Seventh, and its first quarters in the capitol at Washington. Soon after his death his novels were published from manuscript, and his magazine stories reprinted. *Cecil Dreeme*, *John Brent* and his other novels have a breezy, outdoor air that is delightful, while the short story, *Love and Skates*, is an English classic.

Wire, a thinly or, according to the ductility of the metal of which it is made, a more or less attenuated thread or rope, the product of iron, steel, brass, copper, aluminum or platinum in almost universal use for netting, fences, piano-strings, bedsprings, the telephone and the telegraph. Wire is believed to have been in use as early as 700 or 800 B. C. by the people of Egypt and Nineveh; and though in modern times, in use in Britain and Europe, made of strips of hammered metal, the machine-drawn wire is a product only of the last 40 or 45 years. Bessemer steel is the chief metal used for most purposes of wire-making, the process of manufacture being to form steel billets into round rods, which then go through several processes of drawing by means of holes in a draw-plate of varying diameter, when it is cleaned and wound upon drums. In the process of drawing, the wire frequently has to be freshly annealed; while for many purposes, as piano-wire and the spokes of bicycles, the material used has to be a highly-tempered steel. The wire used for bed-springs is chiefly of brass, since it does not rust from moisture as iron does. For cooperage purposes, in connection with wooden hoops in strengthening barrels, the wire used is coppered steel. Telegraph and telephone wire is now made of a bimetallic wire, combining steel for strength and iron or copper for conductivity.

Wirt, William, was born at Bladensburg, Md., Nov. 8, 1772. He began to practice law in 1792 at Culpeper Court House, Va., but within a few years moved to Charlottesville and thence to Richmond. In 1803 appeared his *Letters of a British Spy*. He took part in the prosecution of Aaron Burr, and was attorney-general of the United States from 1817 to 1829. In 1832 he ran for the presidency on the ticket of the anti-Masonic party. Wirt is now best remembered as the author of the famous *Life of Patrick Henry*. He died at Washington, D. C., Feb. 18, 1834. Consult *Life* by J. P. Kennedy.

Wiscon'sin, a north-central state of the American Union, whose area, including Apostle Islands at the western end of Lake Superior and the islands at the mouth of Green Bay in Lake Michigan, is 56,040 square miles, its length being 300 miles, while its greatest breadth is 290 miles. It is bounded on the east by Lake Michigan, on the south by Illinois, on the north by Lake Superior and upper Michigan and on the west by Minnesota and Iowa, the greater part of the latter boundary being formed by the Mississippi River.

Cities and Population. Its capital is Madison. The population of the state is 2,513,758.

In this population foreign nationalities are largely represented, the larger number being German and Poles (German, Austrian and Russian), while there are many Bohemians, Norwegians, Danes, Russians, Austrians, Irish, English and Scotch besides English and French Canadians. Denominationally the Roman Catholics are the leading church; the other churches embracing Lutherans, Methodists, Baptists, Congregationalists and Presbyterians. The Indians number 10,957.

Wisconsin's nickname, the "Badger State," has a curious origin. There are no badgers in the state and the name was originally applied to the lead miners near the Illinois line in early days, because they lived in dugouts on the hillsides similar to the burrows badgers make underground. Afterward the name originally given to these miners was applied to the people of the whole state.

Surface and Climate. Wisconsin consists, in the main, of a level or gently undulating plain, sloping slightly on either side of a height of land (1,500 feet in elevation) and running southward about the middle of the state; while in its northern section there is a line of low-lying hills, the Penokee Range, stretching parallel with Lake Superior and about 30 miles south of it, thence trending northeastward into the northwestern peninsula of Michigan and cutting off the northeastern corner of Wisconsin from Lake Superior. The chief drainage on the west and northwest is by St. Croix, Stillwater, Chippewa, Black and Wisconsin Rivers into the Mississippi; the Menominee, Oconto and Fox (the latter draining Lake Winnebago) fall into Green Bay; and Milwaukee River into Lake Michigan. Rock and Desplaines Rivers flow south into Illinois. Wisconsin has a continental climate, with a rather long and severe winter, though the extreme heat of summer is tempered by the influences of the lakes on its northern and eastern flanks. While there is considerable forest, the cultivated region is large and the land fertile, most of the surface being covered by the clay gravel, marl and sand of the glacial drift, with a fairly deep layer of rich vegetable-mould.

Natural Resources. These consist of the product of the forest, the mines and the agricultural lands. The annual yield of the chief cereals is as follows: oats 69,136,000 bushels; corn 51,188,000; wheat 3,659,000. Barley yielded 22,429,000 bushels, potatoes 24,700,000 and hay 2,260,000 tons. The chief timbers are white pine, hemlock and spruce, though the extent of the cuttings of these has largely denuded the forests. There still are considerable limestone, sandstone and granite in the quarries while the yield from bricks, tiles and other clay-products continues to be large. The iron in the mines principally is red hematite, of which there is an annual output of 1,149,151 long tons. Mineral waters, moreover, are a valued product, yielding $1,132,239 yearly. In addition to the agricultural operations and the resources from husbandry, stock-raising is largely carried on. The number of dairy-cows in Wisconsin is placed at 1,471,591; while of other cattle there are 1,206,569 head. Of horses there are 614,654, of sheep 929,783 and of swine 1,809,331. The dairy products amount to about $30,000,000 annually.

Manufactures. The state's development as a manufacturing one is creditable to the enterprise and industrial activities of its people. There is room for increase, if we may judge from the volume of capital invested (which is in excess of $600,000,000), placing Wisconsin in the eighth rank among manufacturing states. The wage-earners number 82,583, and the amount paid them annually is $93,905,000; while the value of the products was $90,306,000. Lack of coal is a drawback to industries; but in spite of this lack the extent, variety and value of its manufactured commodities are phenomenal. This is explained in part by large natural resources of timber, agricultural, cattle and dairy-products, its great wool-clip and the mineral ores, in addition to extensive water-power and general manufacturing facilities, with the aid given by financial wealth and banking resources and the further aid afforded by its transportation facilities, both by land and by water. Foundry and machine products annually are worth $34,124,000, while of like value are the gross flour and grist-mill products and the yield from the manufacture and sale of malt liquors. The yield from leather, tanned, curried and finished, is close upon $44,668,000; while the trade in cattle-slaughtering and meat-packing yields over $27,217,000; planing-mill products have a gross return of over 11 millions.

Tobacco is grown to the extent of 31,710,000 pounds. Agricultural implements net in excess of 11 millions; carriages and wagons 9 millions; men's clothing 9½ millions; boots and shoes 13½ millions; printing and publishing 11½ millions; paper and wood-pulp nearly 26 millions; and railroad construction material and repairing netted 14 millions of dollars.

Commerce and Transportation. Banking facilities have helpfully increased in the past few years; while the gross deposits show the prosperity and thrift of the people. Wisconsin now possesses 128 national and 517 state banks. The former had over 17 million dollars of capital, and the latter an excess of 13 millions; while the aggregate deposits in the national institutions were close upon 123 millions, and in the state banks close upon 120 millions. There also were a large number of private banks and nine or ten loan and trust companies, each with considerable deposits.

The total railway mileage is in the aggregate 7,475 miles, distributed among the following chief lines: the Chicago, Milwaukee and St. Paul; Chicago, Burlington and Quincy; Chicago and Northwestern; Great Northern; Minnesota, St. Paul and Sault Ste. Marie; Illinois Central; Wisconsin Central; Northern Pacific; and Duluth, South Shore and Atlantic (Canadian Pacific) railroads. Besides these facilities are those by steam-vessels on Lakes Michigan and Superior, in addition to the transportation *via* the Mississippi, Wisconsin, Fox and Chippewa Rivers, not to speak of the canal connections between Portage and Fox River. The assessed valuation of property is very nearly $3,000,000,000. The state's debt, incurred mainly during the Civil War, amounts to 2¼ millions; and its expenditure is about a like sum.

Education. Wisconsin is far-sighted enough to see the advantage of dealing liberally with education. Its annual expenditure for public schools amounts to $13,292,068, including the amount appropriated for the maintenance of the state's normal and the counties' training-schools for teachers. Out of a school-population of 780,008, the enrolled pupils number 460,470 and the daily average attendance is about 351,830. The number of teachers is now over 14,000, the most of whom are women. There are about 300 free high schools, with a gross enrollment of 34,800. Higher education is represented by the University of Wisconsin, at Madison, with 470 instructors and 5,533 students; by Lawrence University (undenominational), at Appleton, with 45 instructors and 650 students; by Beloit College (Congregational), with 35 instructors and 410 students; by Ripon College (Congregational), with 27 instructors and 267 students; by the Northwestern University, a Lutheran institution at Watertown, with 12 instructors and 221 students; by Marquette University (Roman Catholic), at Milwaukee, with 161 instructors and 1,100 students; by Concordia College (Lutheran) at Milwaukee; and by Milton College (Seventh Day Bap.), with 13 instructors and 88 students. The state also maintains industrial schools for children of both sexes, schools for the deaf and the blind, homes for the feeble-minded and insane and hospitals, reformatories and penitentiaries.

History and Government. From an early period the region was the theater of mission work undertaken by French-Canadian priests and of the discoveries of gentlemen-explorers from New France, as well as the fur-trading and trapping ground of French-Canadian *coureurs des bois*. They came thither from Quebec by way of Ottawa River, Lake Nipissing, Rainy River and the Great Lakes, thence *via* Sault Ste. Marie to Marquette and Duluth on Lake Superior or *via* St. Ignace to Green Bay on Lake Michigan. These expeditions date as far back as the era of Champlain, governor of New France in 1633-5, and among them numbered Nicolet, the first white man, it is believed, to visit Green Bay, and the fur traders, Radisson and Groseilliers, supposed to have discovered the upper Mississippi in 1659. In 1665 Father Allouez established missions at La Pointe and on Fox River; he was followed about 1673 by the explorers Louis Joliet and Pere Marquette, the latter proceeding by canoe south from Green Bay as far as the site of Chicago. Du Luth is another adventurer of the time, his name being perpetuated in that of the city of Duluth; after him came Charles De Langlade, who took part in the French and Indian War of his era and allied himself with the British in the War of the Revolution. In the War of 1812 the French, associated with the Indians, took the British side in the struggle and even made a raid on Prairie du Chien on the Mississippi, capturing its American garrison. Meanwhile the fur-trade was being prosecuted, and immigration slowly began to enter. For the protection of the newcomers and to assist the national authority forts began to be built and garrisoned, especially Fort Howard on Green Bay and one at Prairie Du Chien. Internal development followed, particularly after the discovery of the lead-mines at Potosi and Mineral Point, though the country was periodically disturbed by trouble with the Indians of the region — Sacs, Foxes, Sioux, Chippewas and Winnebagos. An incident in the disaffected condition of the native tribes was the Black Hawk War of 1832, which was presently put down, while the Indians were removed to and protected on new reservations. About the close of the 18th century efforts were made to organize the region as a territory, though it passed through many vicissitudes, being at first part of the Northwest Territory, subsequently oscillating in its attachment to Indiana, to Michigan and to Illinois and then back to Michigan again. Finally in 1836, on the admission of Michigan as a state, Wisconsin, with parts of Iowa, Minnesota and the Dakotas, was erected into a territory, Belmont and Burlington successively being the capital. For 12 years it remained a territory, being shorn meanwhile of parts of its assigned limits; in May, 1848, however, it was admitted into the Union under its first constitution, Madison becoming the capital. About this period, owing to the revolutionary upheaval in Europe, the state received large additions of Germans to its population, while later it took a helpful and patriotic part in the Civil War, furnishing a total contingent of over 90,000 men. The state in 1871, 1894 and 1908 suffered from destructive forest-fires. Its local legislature consists of a senate of 33 members, elected every fourth year, and an assembly of 100 members, returned biennally. It sends 11 representatives to the lower house of Congress. Its executive officers are elected for two years each. The judicial power is vested in seven supreme-court and 18 circuit-court justices. Consult Thwaite's *Story of Wisconsin*, Strong's *Histories of the Territories of Wisconsin*, Legler's *Leading Facts in the History of Wisconsin* and Hebberd's *Wisconsin under the Dominion of France*.

Wisconsin River, a branch of the Mississippi, rises in Lake Vieux desert on the northeastern border of Wisconsin, flows south 600 miles, and falls into the Mississippi four miles below Prairie du Chien. It is navigable for steamboats for 200 miles to Portage, where it is joined by canal to the Fox, thus making a waterway across the state from Lake Michigan to the Mississippi by way of Green Bay, the Fox and the Wisconsin.

Wisconsin, University of, at Madison, Wis., was chartered in 1848, and opened in 1849. It was reörganized in 1858, but during 1861-5 so many of its students entered the Federal army that in 1864 commencement could not be observed. In 1866 came another reörganization, and since then progress has been unbroken. The university received its national grant for founding colleges of agriculture and industrial arts; opened the regular collegiate course to women; and later established coëducation in every department. The university is the crown of Wisconsin's public school system, and most high school graduates enter without examination and pay no fee for tuition. Since 1892 many special courses have been added, and graduate students have greatly increased in numbers. The most characteristic feature of the organization is that all types of higher education are included within the one institution. Thus the university consists of the College of Letters and Science; College of Mechanics and Engineering; of Law; of Agriculture; of Medicine, which offers the work of the first two years of a medical school; and the Graduate School. All divisions offer courses in a summer session; and there is a division of university extension, including a correspondence school and special courses for artisans. In addition to the professional and technical colleges, courses preparing for particular vocations are administered within the College of Letters and Science, i. e. courses in chemistry, commerce, journalism, and teaching, a library school and a school of music. The College of Agriculture includes the Wisconsin agricultural experiment station, organized farmers' institutes, and a course in home economics. There are 46 scholarships, 32 fellowships, and 14 loan funds for students. The university library and that of the Wisconsin Historical Society contain excellent manuscript and newspaper material in American history, a wealth of printed works on history, Greek language and literature, political and social science and railroads, the publications of learned societies, and Shakespereana. In 1915 the faculty numbered 711, the students 7,596, and the libraries put 640,300 volumes at the command of the university, while its productive funds amounted to $782,662 and its income to $2,758,118. The recent history of the university has been notable for great material progress and for the organization of many activities for social service. The university is notable for the active part taken by the students in their own government.

Wise, Henry Alexander, an American statesman, was born at Drummondtown, Va., Dec. 3, 1806. He graduated at Washington College, Pennsylvania, and studied law. He became prominent in politics, advocating the nomination of Jackson at Baltimore and favoring the doctrine of states' rights. He was sent to Congress in 1833, where he went over to the Whig party, in opposition to Jackson's course. Under Tyler, whose nomination Wise had secured, he had a strong influence and was made minister to Brazil. In 1854 he became governor of Virginia. In December, 1859, he signed the death-warrant of John Brown (*q. v.*). Though making an effort for peace as a member of the Virginia convention, he went with his state into secession, and became a brigadier-general in the Confederate army. He served in the Kanawha valley and at Roanoke Island. Here his forces were captured and his son was killed. He wrote *Seven Decades of the Union*. He died at Richmond, Va., Sept. 12, 1876.

Wise'man, Nicholas, cardinal and Roman Catholic archbishop of Westminster, was born at Seville, Spain, of Irish parents, Aug 2, 1802. He studied in Ireland and at Rome, where his brilliant course secured him in 1823 the appointment of vice-rector of the English College, which in 1828 was changed to rector. In England he first became known by lectures on the doctrines of the Roman church, which were followed by the founding with Mr. O'Connell of *The Dublin Review*. His appointment as archbishop of Westminster and cardinal produced great excitement, as it was looked upon as an effort of the Roman church to recover possession of England, where there had been no Roman Catholic bishops since the reign of Elizabeth. Wiseman's addresses and publications did much to allay the excitement, and his ability and moderation as well as his literary position won the admiration of all. He wrote on literature and art besides his religious works. *Influence of Words*, *Lectures on Religion and Science*, *Points of Contact between Science and Art*, *Fabiola* and *The Real Presence* were books that obtained a large circulation. He died at London on Feb. 15, 1865.

Wista'ria, a class of climbing plants named after Professor Wistar of Philadelphia. The leaf is formed of from nine to 15 oval leaflets, and the flowers, usually lilac in color, grow in thick, long clusters and resemble the flowers of the locust-tree or sweet peas or other plants of the *Leguminosæ* or bean family, to which it belongs. The seeds or beans are found in long pods. It grows rapidly, often 20 feet in a season. The Chinese wistaria, introduced from Japan, blooms earlier, with a looser cluster of flowers, of a paler lilac or white. There are several other varieties, including a double-flowered one.

Wis'ter, Owen, American author and story-writer, was born in Philadelphia, Pa., on July 14, 1860. He is a grandson of Fanny Kemble, the actress. He graduated in 1882 from Harvard. He subsequently passed through Harvard Law School, was admitted (1889) to the Philadelphia bar, but two years later took to a literary career, chiefly writing stories of western life and character. Besides contributing articles to The American Sportsman's Library on the bison, musk-ox, sheep and goat, Mr. Wister's other well-known works embrace *Oliver Wendall Holmes* in the American Men of Letters Series and *Benjamin Franklin* in the English Men of Letters Series. His other writings include *The Dragon of Wantley; Red Man and White; Lin McLean; U. S. Grant; The Virginian; Journey in Search of Christmas;* and *Lady Baltimore*.

Witch and Witch'craft. The names witch and wizard are given to persons supposed to possess unusual powers,popularly thought to have been acquired by a compact with Satan. The belief is an old one, as the Witch of Endor is said to have raised Samuel for Saul in the early days of the Jewish nation, and Paul had several contests with sorcerers. Sorcerers, soothsayers, diviners and magicians often were popularly classed together and with witches; but the magicians claimed to be a distinct class, using their knowledge of the secrets of nature for the benefit of mankind, while the witches and sorcerers delighted in doing harm. The belief in evil spirits has been common in every nation and country, and the legends of a people are full of the deeds of supernatural beings. In popular belief a witch usually was an old woman, who rode on a broomstick through the air by night to attend the witches' gathering and delighted in acts of spite and meanness. Their victims, on whom they had cast the evil eye, pined away mysteriously or were troubled by strange noises and curious losses. The witches' mark was a spot of some kind made on the body by the devil as a sign of his bargain, and was indelible. It was sought for by the class of inquisitors known as the witch-finders. Shakespeare's *Macbeth* and other plays, Burns' *Tam O'Shanter* and the *Walpurgis Night* in Goethe's *Faust* give an idea of these popular beliefs.

The belief in witchcraft as the work of evil spirits led to the bloody and cruel persecution and punishment of witches which lasted in Europe for four centuries. In these, it is estimated, 9,000,000 persons were put to death. The bull of Pope Innocent VIII in 1484 began the work of destruction in which confession was extorted by torture and the testimony of enemies and children accepted. In one year, in the district of Como, 1,000 persons suffered as witches and 500 in three months in Geneva, while 4,000 persons perished in Scotland, and during the session of the Long Parliament (1640-52) 3,000 persons were condemned in England. The delusion was almost universal, such a judge as Sir Matthew Hale giving sentence against a suspected person and a physician as eminent as Sir Thomas Browne declaring his belief in witchcraft, in spite of having written a volume on *Popular Fallacies*. The last execution in England was in 1716, and the laws against witchcraft were repealed in 1735. The last execution on the European continent took place in Posen as late as 1793. The persecution of supposed witches in Salem, Mass., was a result of the general belief so common at the time. Cotton Mather, in 1685, published an account of cases of witchcraft and made experiments on suspected persons, by which he learned that the demons understood Latin, Greek and Hebrew well but Indian dialects only imperfectly. He wrote *Wonders of the Invisible World* to convince doubters, and his book received the recommendation of the governor of the colony and the president of Harvard College. Nineteen persons were hanged between June and September of 1692. Consult Poole's *Cotton Mather* and Upham's *Salem Witchcraft*.

Witch'-Ha'zel, the name of a small tree or shrub belonging to a family of which there are several species, among them the liquid-amber, a forest tree. The witch-hazel grows in damp woods about ten feet high has leaves much like the hazel, with clusters of three or four bright yellow flowers which appear in the fall. The fruit is a pointed, two-celled pod, which does not ripen until the next summer. The wood is white, the bark and leaves contain tannin, and an extract of the bark and leaves is used as an external application in medicine. The name of witch-hazel comes from a popular belief that a green branch held in the hands will turn toward the ground to indicate a hidden supply of water or of gold.

Wit'te, Sergei Julievitch, a Russian statesman, born at Tiflis, June 17 (Old Style; July 29, New Style), 1849. His father was of modest German extraction, but his mother was descended from the princely Dolgoruki family. From earliest childhood he was instructed at home by the best teachers in Tiflis, even while he studied at the classical gymnasium; he grew up a true Christian, a Russian in soul and mind. He completed his education in scientific lines at Odessa; and although, by birth, by the station of his relations, by education and by natural endowments he could always count upon a successful public career, he connected himself with the steamship and railroad company then under the supervision of Admiral Chikhchov. At the same time he entered the government service in the office of Governor Kozebu. He distinguished himself in the Russo-Turkish War of 1877-8 by his achievements in military transportation. This gained him the position of Minister of Ways of Communication, and in 1896 he was promoted to the head of the financial ministry. He has applied his principles of economy to the development of Russia, including protection, and to the exploitation of mines. He is credited with having inaugurated the plan for the Trans-Siberian Railway (*q. v.*). He possessed the confidence of his sovereign, the esteem of the outside world and, especially, the full reliance of foreign financial communities. The brilliant success of the Russian war-loan was mainly due to Count Witte. He was the head of the Russian embassy at Portsmouth (1905) to formulate a treaty of peace with Japan, a task which he accomplished in spite of the Russian government. He urged the Czar to call the *Duma*. In 1905 he became prime minister, but retired in May of 1906 rather than be associated with the party of reactionaries. At Algeciras he reinstated Russia into the place of influence she had temporarily lost in the councils of Europe. He was the ablest statesman and diplomatist of Russia of his time. He died in 1915.

Wittenberg (*vĭt'tĕn-bĕrg*), a town of Prussian Saxony, is on Elbe River, 45 miles southeast of Magdeburg. It is famous as the home of Luther and Melanchthon, whose tombs are in the church on the doors of which Luther nailed his famous theses. The church was restored, and in 1858 new bronze doors with the theses in Latin were erected. In another church are two pictures: one of Luther preaching, the other of Melanchthon administering the communion. The houses of Melanchthon and Luther are still shown, Luther's containing his chair and table and two portraits of himself; and in the market-place is a bronze statue of him. The university where Luther was professor and where, according to Shakespeare, Hamlet studied, has been removed to Halle. Wittenberg has manufactures of woolen and linen goods, hosiery, leather, brandy and beer. Until 1422 it was the residence of the dukes and electors of Saxony. In 1547 it was taken by Charles V and in 1760 by the Austrians, when nearly one third of it was destroyed. Napoleon captured it in 1806 and fortified it in 1813, the Prussians finally capturing it in 1814. Population 18,340.

Wo'burn, Mass., a city and manufacturing center in Middlesex County, eastern Massachusetts, on the Boston and Maine Railroad, ten miles northwest of Boston. The chief industry is tanning and dressing leather and manufacturing boots and shoes; there also are glue-factories and chemical works. The town has good schools, churches and a well-equipped public library. Population 15,308.

Wolcott (*wŏl'kŏt*), **Roger,** a governor of Connecticut, was born at Windsor, Conn., Jan. 4, 1679. He was in service in the attack on Canada in 1711 and at the siege of Louisburg in 1745. He was governor of Connecticut from 1751 to 1755, and had already been a member of the assembly and of the council, a judge and deputy-governor. He published poems and a history in which is an account of the Pequot war. He died on May 17, 1767.

COMMON WOLF

Wolf, a carnivorous mammal belonging to the dog family. The domesticated dogs are very likely descended from wolves. The latter have a wide geographical range, being found over nearly the whole of Europe, Asia and North America. There are none in South America or Africa, the jackal and foxes apparently taking their place in those countries. Wherever found near inhabited regions, they prey upon sheep, which they run down in open chase. Assembled in packs, they also attack herds of cattle; and, when bisons were abundant on the western plains, they would overcome those large animals. They are characterized by cunning, cowardice and cruelty; they keep well out of the sight of man; will forsake their cubs in time of danger; make a practice of killing and devouring their wounded; and eat their own dead. Centuries ago wolves were abundant in the British islands, but they were hunted by the ancient Britons, and at different times a reward was offered for their heads and skins. As a result they were exterminated. They became very scarce in the 16th century, and by the middle of the 18th century were exterminated in England, Scotland and Ireland. In America the common wolf and its varieties extend from Greenland to Mexico. They are about 65 inches long, with a tail of 15 inches. They vary in color, but are chiefly gray, becoming whitish in the north and dark in the south. In Florida there are black wolves and in Texas red ones. The gray wolf, often called timber-wolf, is a formidable creature, large and robust. They have been persistently hunted, a high bounty placed on them, but are a pest still on the cattle-plains. Their cry is a prolonged howl, bloodcurdling and mysterious. The coyote is a smaller wolf, peculiar to the United States. It is common on the western plains, having its den in holes in steep banks and in "washouts." It reaches a length of about 55 inches, and is yellowish gray, clouded with black. It steals poultry, pigs, lambs and sheep, but feeds chiefly on prairie-dogs, ground-squirrels, rabbits, hares and sage-grouse; will attack deer and the prong-horned antelope. Its cry is between a howl and a bark. Wolves do not sleep in winter as does the bear, but hunt throughout the cold days. See Dog and Jackal.

Wolfe, Charles, a British poet, was born at Dublin, Dec. 14, 1791. He graduated at Trinity College, Dublin, and was a curate in Tyrone County. He is famous for his ode on the burial of Sir John Moore, beginning with the words: "Not a drum was heard, not a funeral note," which is known to every schoolboy. He died at Cork, Feb. 21, 1823.

Wolfe, James, an English general, was born at Westerham in Kent, Jan. 2, 1727. When only 13, he was prevented by sickness from going with his father, a British officer, on the expedition to Cartagena. In his first service in Flanders he took part in the famous battle of Dettingen, and in Scotland was at the battles of Falkirk and Culloden. His conduct while in charge of a regiment in Scotland and in the expedition against Rochefort in 1757 won him the rank of colonel and gave him the command of a brigade in the expedition against Cape Breton. His skill and bravery at the attack on Louisburg won him the title of Hero of Louisburg. In the effort to drive the French out of Canada Pitt (Earl of Chatham) gave the charge of the invading army to Wolfe, who had been made major-general. The story of his attack on Quebec, how he scaled the cliffs with his army by night, and died in the moment of victory, while his brave antagonist, Montcalm, dying too, said: "It is a great consolation to have been vanquished by so brave an enemy," is well-known. He died on Sept. 13, 1759. Consult *Life* by Wright and *Montcalm and Wolfe* by Parkman. See Canada, England, France and Quebec.

Wolseley (*wŏŏlz'lĭ*), Viscount **Garnet Joseph,** G. C. M. G., P. C., etc., field-marshal and former commander-in-chief of the British army, was born near Dublin, June 4, 1833, and was educated under tutors. He entered the English army in 1852 and served successively in the Burmese War and Crimean War, and was severely wounded at the siege of Sebastopol. He subsequently served in India and China and in 1867 in Canada, where he acted as deputy-quartermaster-general and commanded the expedition to Red River, Manitoba. In 1873 he commanded the troops on the Gold Coast of Africa during the Ashanti War, and entering Kumasi received the submission of the king. For this campaign he received the thanks of Parliament and a gratuity of £25,000 "for courage, energy and perseverance." He also received the freedom of the City of London and a sword valued at 100 guineas ($525). In 1875 he was governor of Natal; in 1880 quartermaster-general of the forces; and from 1882 to 1885 was adjutant-general. In 1882 he was in command of the expeditionary force in Egypt and of the Gordon relief expedition. Subsequently he was commander of the forces in Ireland, was raised to the rank of general (1882) and field-marshal (1894), and from 1885 to 1900 was commander-in-chief. Author of a *Life of Marlborough*, *The Decline and Fall of Napoleon* and *The Soldier's Pocket-Book for Field Service*. He died March 25, 1913.

LORD WOLSELEY

Wolsey (*wo͝ol'zĭ*), **Thomas,** an English cardinal, was born at Ipswich in Suffolk in March of 1471. He secured an education at Oxford, and became rector at Lymington. Through the influence of a friend he was made chaplain to Henry VII, with whom he became a favorite, and was appointed dean of Lincoln. When Henry VIII became king, Wolsey governed the kingdom. Honors were showered upon him. He was made bishop of Lincoln, archbishop of York and cardinal. In 1515 he was prime minister and lord high chancellor. He was successful in command of the royal army at Tournay, and effected a treaty in 1514 with Louis XII of France, which left England the first power in Europe. His income was enormous, and large sums were used in founding a college at Ipswich and Christ Church College at Oxford. Wolsey's efforts to obtain Pope Clement VII's permission for Henry's divorce of Queen Catherine were unsuccessful and lost him the royal favor, which alone had stood between him and those whom his splendid living and overbearing conduct had made his enemies. Anne Boleyn, whose marriage to the king he had opposed, with Norfolk her uncle, plotted his ruin. He was driven from court to his diocese in York, where he won the hearts of the people by his gracious manner. The king, too, showed signs of relenting, and his enemies, alarmed, had him arrested for high treason, but he died at Leicester Abbey on his way to London, Nov. 29, 1530. Consult Shakespeare's *Henry VIII* and Froude's *History of England*.

Wolverhampton (*wo͝ol'vĕr-hămp'tŭn*), a market-town of Staffordshire, England, is 13 miles northwest of Birmingham, on a height which commands a fine view toward Wales. The old church was founded in 996 and the free grammar-school in 1515. There are a corn-exchange, market-hall, agricultural hall, public baths, a free library, a cattle-market covering five acres and a large park. It is famous for the manufacture of hardware, especially iron implements, tools, locks, hinges, nails and kitchen furniture. It also has smelting-furnaces, iron and brass foundries, chemical works, dye-works, rope-walks, varnish-works and breweries. The town was named Wulfrunahamton in honor of Wulfruna, sister of Ethelred II, who founded the church and college in 996. Population 94,187.

Wol'verine', a carnivorous animal of the northern forests of Europe, Asia and America. There is only a single species. It is a member of the marten family, a member notorious as a glutton and a pest. It is remarkably cunning and a very successful thief. The trapper hates it, for again and again it will steal his bait and his capture. It will raid cabin and camp, destroying in wholesale fashion, seemingly from pure malice. The American form is about the size of a bull-dog. It has paws similar to those of a bear; the body is covered with shaggy hair of a blackish color, with pale bands along the sides of the body and one on the forehead. The body and limbs are stout, and the animal resembles a small bear. It climbs trees, and during the breeding-season forms burrows for the mother. It feeds on squirrels, hares, foxes, grouse, reindeer and other animals. Michigan is called the Wolverine State from the occurrence of the wolverine in its forests. The animal is found in the northern Cascades, in the Rockies as far south as Great Salt Lake and in arctic America, abounding in portions of Alaska.

Wom'an's Chris'tian Tem'perance Un'ion. See Total Abstinence.

Woman's Relief-Corps, a patriotic society, dating from 1883, whose aim is to perpetuate the memory of the dead soldiers of the Civil War and to care for their dependents. The society, which has 150,000 members, has, it is said, expended over two million dollars in its aid to needy women and orphans of Union veterans. Like the Grand Army, after which it in part is modelled, it is divided into 35 or 40 departments and into lesser divisions termed corps, of which there are over 3,200. The order meets annually.

Women's Clubs. It is impossible to give data of the first woman's club but among the first to be organized were the Sorosis of New York City and the New England Woman's Club of Boston in 1868; the former by Mrs. Jennie C. Croly (Jennie June) and her co-workers and the latter by Mrs. Julia Ward Howe, Mrs. Mary A. Livermore and other progressive women.

It now has a membership direct, indirect and allied of over 1,000,000.

The work accomplished can not be overestimated. The cultural value of the clubs is great but the real purpose of club work is service and as a civic force in the United States today, it is doubtful if it is surpassed by any other organization. Thousands of public and traveling libraries have been established; scholarships founded; traveling art galleries circulated; traveling exhibits of household art and appliances instituted; parks and playgrounds opened and equipped; visiting nurses supported; police matrons employed; mountain schools conducted. Innumerable other examples of public service stand to the credit of the clubwomen of America. Perhaps, however, the greatest service which they have rendered has been the education of public opinion along the lines of child welfare, improved legislation, social hygiene, public health, and other forms of higher and better civilization. MARY I. WOOD, *Manager Information Bureau, General Federation of Women's Clubs.*

Women's Rights. The movement in the United States is now an old one to give women equal rights with men as citizens, with the widest opportunities in securing a high education, a share in all occupations and industries in which they may care to participate, emancipation from undue legal restraints and hindrances, freedom to enter the medical and other professions and the right of the suffrage (*q. v.*) and political representation. The cause of women, in seeking these rights and privileges, has from an early day been strenuously advocated by such notable women in England as Mary Wollstonecraft Godwin, in America by Lucy Stone, Lucretia Mott, Elizabeth Cady Stanton, Lydia Maria Child, Julia Ward Howe, Susan B. Anthony, Mary Putnam-Jacobi and others. (See articles under titles above.) Abroad, kindred movements among the sex have been organized, with the result that many gains have been made for which women have sedulously sought. Many notable representatives of the male sex have also been in sympathy with women in seeking for and obtaining their rights, particularly in England since the publication of John Stuart Mill's essay on *The Subjection of Women;* while in this country much has been achieved by men's aid, especially since the era of Emerson, Theodore Parker, Henry Ward Beecher, W. H. Channing, Wendell Phillips, Bronson Olcott, W. Lloyd Garrison and Thomas W. Higginson. (See articles under titles above.) The removal of disabilities and the enfranchisement of women have also been much aided at different periods in this country by woman's rights conventions, which date from as early as 1848, the year when organized agitation began. These gatherings were followed about 20 years later by the formation of two national organizations in favor of woman suffrage, which were subsequently (1890) united in the National American Woman Suffrage Association.

DO WOMEN EXERCISE THEIR FRANCHISE?

The association answers an important question with the following figures giving the percentage of women who vote in the states named: Wyoming 80 to 90; Colorado 75 to 85; Utah 85 to 90; Idaho 75 to 85; Washington 85 to 95; California 90 to 99. Women have full suffrage among other countries, in Great Britain, Russia, Norway, Finland, Australia, New Zealand and in America in New York, Wyoming, Colorado, Idaho, Utah, Washington, California, Kansas, Nevada, Montana, Oregon, Arizona and Alaska. In 1913 Illinois extended to women the right to vote for all public offices not provided for by the State Constitution. They have municipal suffrage in Sweden, Denmark, Iceland, England, Ireland, Scotland, Wales, a number of the provinces of Canada, in the cities of Broda and Bombay in British India and in Burma. They have certain limited franchise rights in parts of Cape Colony, Austria-Hungary and in Portugal. Women have limited suffrage in New Mexico, Oklahoma, New Jersey, Connecticut, Massachusetts, New Hampshire, Vermont, Kentucky, Ohio, Wisconsin, Minnesota, North Dakota, South Dakota, Nebraska, Michigan, Delaware, Mississippi and Louisiana. (See CITIZENSHIP.) The national election of 1916 was distinguished by the election of the first woman to a seat in Congress, Miss Jeannette Rankin of Missoula, Mont.

Wom'bat, a marsupial or pouched animal of Australia. The body is a little more than two feet long, covered with dark-brown hair, and the animal has somewhat the appearance of a small bear. The tail is rudimentary, and the legs are short and stout. The toes end in sharp, curved claws which are of service to the animal in burrowing. These animals are active at night, and feed largely on roots. They are easily caught alive, but in captivity show no affection for their keepers, caring only for food given them. Their flesh is said to resemble pork in flavor and is often eaten.

Wood, Leonard, major-general U. S. A. and chief of staff, was born at Winchester, N. H., Oct. 9, 1860, and graduated in medicine at Harvard Medical School (1884). In 1886 he was appointed first lieutenant and assistant surgeon in the United States army, and reached the rank of captain and surgeon in 1891. In 1886 he served in Arizona and New Mexico in General Miles' campaign against the Apaches under Geronimo and Natchez, and received a medal of honor for this duty. In May, 1898, on the outbreak of the Spanish-American War, he recruited the 1st regiment of United States volunteer cavalry ("Rough Riders"), and took part in the fight at Las Guasimas and in the battle at San Juan near Santiago de Cuba, and was given the rank of brigadier-general for gallant service in Cuba. In July, 1898, he succeeded General Brooke as governor-general of Cuba, where he greatly aided in the orderly government and the improved sanitary condition of the island. He remained in that office till the withdrawal of the United States in May of 1902. In 1903 he was placed in command of the army in the Philippines; in 1908, of the department of the east, and in 1910 made chief of staff.

Wood or Methyl Alcohol, a colorless, spirituous liquid, with a strong aromatic odor, the product of the distillation of wood. It is used in the manufacture of dyes, as a solvent for varnishes and as a methylated spirit after it has been mixed with ethyl alcohol. See ALCOHOL.

Wood'bine', a common name for the Virginia creeper or American ivy, *Ampelopsis quinquefolia*. The name was originally applied in Europe to a species of honey-suckle (*Lonicera*). See IVY and VIRGINIA CREEPER.

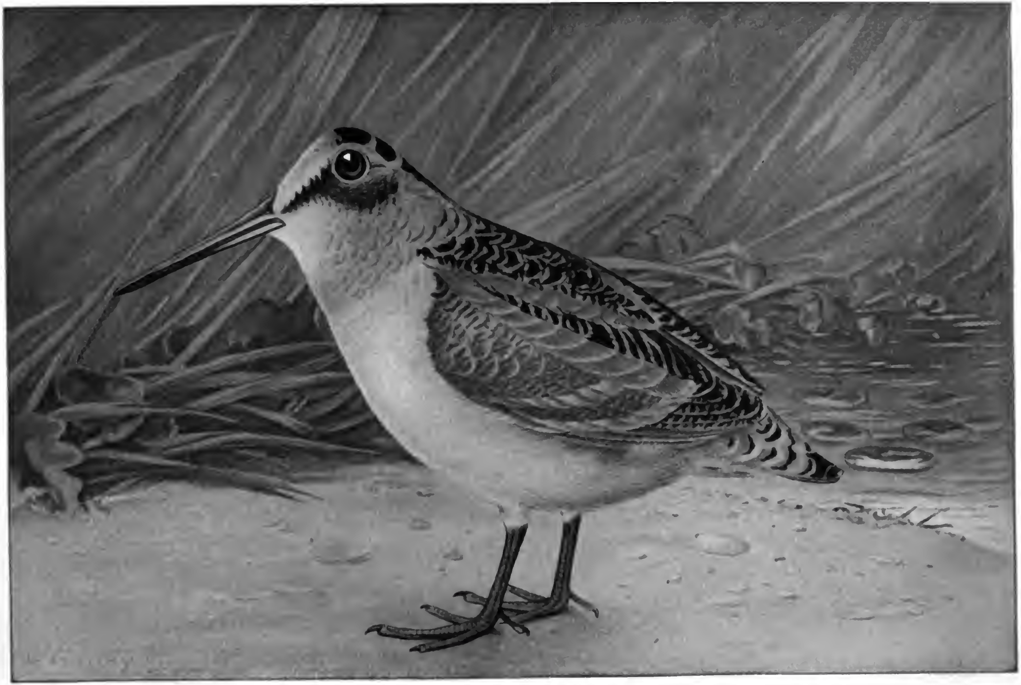
Wood-Carv'ing, one of the oldest branches of art, was much practiced among the Egyptians, Greeks and Romans. A life-size statue of a man carved out of a solid block of sycamore, dating probably from 4000 B. C., now in Bulaq Museum, is a fine specimen of Egyptian wood-carving. Egyptian carvings have been preserved in the tombs, but the Greek and Roman carvings have nearly all perished and are known to us only by the descriptions of early writers. It was much used in the decoration of churches in the middle ages, and reached its height in the 15th century, when every church had its carved oak-screen and stalls. The roof of Westminster Hall, made in the early part of the 15th century, is one of the finest examples of the open timber-roof, which admitted of fine decoration. Skill in wood-carving still lingers in Nuremberg and Switzerland. The Moslem wood-carvers of Persia, Syria and Spain produced beautiful work, seen in the mosques and private houses of Damascus, Cairo and other oriental cities. The wood-carving of China and Japan is the finest in the world.

Wood'chuck' or **Ground-Hog,** a burrowing rodent of eastern North America, belonging to the family of ground-squirrels. It is a true marmot, related to the prairie-dog. It has a heavy body, short legs, flat head and beady eyes. The color varies from brownish-gray to blackish. It burrows in swamp-lot and wood-pasture, and feeds on clover and grass. In summer it stores up enough fat to keep it through the winter; retiring early in November, it sleeps soundly for months, curled up with nose under paw, that the warm breath may not be wasted. On February second, so tradition says, the animal comes forth to take a look around; if the sun is shining and it can see its shadow, it retires to its burrow for six more weeks of sleep. This is by some folk considered a prediction of a late, cold spring. See MARMOT.

Wood'cock', a famous game-bird belonging to the snipe family and found in northern parts both of the Old and the New World. The American woodcock is about 11 inches long, variegated in black, brown, gray and rusty colors. The bill is very long and flexible at the end. It is thrust into the soft ground in search of earthworms, and the presence of woodcocks can often be detected by a cluster of these holes. The European bird is larger. It is a winter resident in England, breeding in summer in the north of Scotland.

WOODCOCK

Wood-Engrav'ing is copying pictures from blocks of wood, and differs from plate or steel engraving in having the picture raised on the surface of the wood, instead of being sunk, as it is in the metal. The picture is printed from the prepared block, as the letters are from type, the block being made the height of the type. The wood must be hard and fine-grained, box-wood being the best. The block of wood is covered with a white coating, on which the artist draws the picture with lead-pencil, pen or brush. The engraver then cuts away all of the wood around the drawn lines, leaving them raised or in relief. For large pictures several blocks are fastened together for the drawing, and then given to different engravers, so that a large picture can be produced very quickly. Wood-engraving is the earliest and simplest form of engraving. The Chinese claim to have printed from wooden blocks 1,000 years before Christ, and it is probable that the art was brought from China to Europe. A wood-cut of St. Christopher, dated 1423, is one of the oldest specimens of engraving. It was used largely in Europe in the 15th century



WOODCOCK

for two very opposite purposes: the engraving of playing-cards and the illustration of books of devotion. A book of 40 leaves, with a picture and a text of Scripture on each page, is one of the earliest illustrated books known, dating back to the early part of the 15th century. Dürer made great advances in the art in the beginning of the 16th century, and Bewick, who in 1790 published his *British Quadrupeds* and in 1804 *British Birds*, illustrated by himself, showed the possibilities of the art and made it one of the most important of the arts. Its use became general in books, magazines and newspapers, but has been superseded by the various forms of photographic reproduction.

Wood-Pewee. See PEWEE, WOOD.

Wood'peck'er, the name for any member of the family *Picidæ*. This includes birds with stout bills with which they peck wood to obtain insects. Their long tongue is barbed at the end and capable of being greatly protruded. It is in every way adapted for piercing and securing insect larvæ. These birds are of great service to the farmer. Professor Beal declares that they are the "only agents which can successfully cope with the insects of forest and partly of fruit-trees, and for this reason if for no other they should be protected in every possible way." As a family they are black and white, stiff quills and pointed tails helping them to brace against tree-trunks. Though not songsters, they have loud calls and communicate by drumming. They nest in holes in trees, sometimes in telegraph poles.

HAIRY WOODPECKER

The woodpecker is hard at work—
A carpenter is he—
And you may hear him hammering
His nest high up a tree.

There are about 350 species found in all parts of the world, except the Australian region and Madagascar. Nearly half of the entire number occur in the New World, and about 25 species are found in North America. Their colors generally are bright, and the males usually have some red on the head. Among the species of the United States the flicker or golden-winged woodpecker is one of the best known. It feeds mainly on ants, and therefore is frequently seen on the ground. The other woodpeckers almost always are seen on trees. The red-headed woodpecker is abundant in the United States east of the Rocky Mountains. The downy and hairy woodpeckers are smaller birds, both being common. The ivory-billed woodpecker, with a length of 21 inches, is the most magnificent of North American woodpeckers. It is black, with white on the shoulders and wings and, in the males, a scarlet crest. This bird is found in the south and formerly ranged as far north as southern Illinois. The pileated woodpecker also is one of the giants of the family; it has a blackish-brown body and a scarlet head and crest. It is very wild, rare, save in deep forest far from haunt of man. The yellow-bellied woodpecker is the one real sap-sucker. Consult Eckstrom's *The Woodpeckers*. See FLICKER and SAPSUCKER.

Wood's Hole, a town in Falmouth Township, Barnstable County, Mass., on Cape Cod, noteworthy as a center for zoological research. Here is the Marine Biological Laboratory, which is the most important seaside laboratory in America. The laboratories of the United States Fish Commission are also here.

Wood'stock, Can., in Oxford County, Ontario. It has excellent railway accommodation by the Canadian Pacific and the Grand Trunk and electric railway communication with adjacent towns. It is the center of a rich dairying country. Its furniture, wagon and piano factories do a large epxort business. It owns its own electric plant. The province maintains an epileptic hospital here.

Wool, one of the most important of all animal substances, ranks next to cotton in its use in the manufacture of clothing. It is a sort of hair, growing on sheep and on goats. The fiber differs from a hair in being crinkly or wavy and in having very minute scales, both of which properties fit it for its uses. The wavy twist keeps it from unwinding when made into yarn, and the scales make the threads catch each other, a process known as felting. Wool varies in quality with different species of sheep and also with the food, shelter and climate. The Saxon wool has the most of the felting property, and the wool of the Angora goat, called mohair, is the whitest, while that of the Kashmir goat is very soft and rich though short. The merino sheep furnishes one of the best varieties of wool, a single fleece usually weighing about four or five pounds. In the manufacture of woolen goods the wool is sorted into different grades, washed, scoured and dried. It is then dyed, if to be dyed in the wool, and carded or made into threads, ready for weaving. After weaving, the cloth is scoured to remove the oil and dust, dyed, if dyed in the piece, and dried on stretchers. It is then fulled, a process that shrinks the cloth and makes it more compact. Teasling, a process to raise the threads, and shearing, which cuts them the right length to form the nap, follow, shearing often being repeated several times. The boiling of the cloth, which prevents spotting and gives a luster, brushing, pressing and folding finish the work. Broadcloths, cassimeres and beavers are strictly woolen goods, while merinoes, bombazines, delaines etc. are worsted goods, named from the town of Worsted, England, in which the processes of manufacture are somewhat different, the wool being combed, which prevents its felting as closely, and also differently spun. The introduction of machinery and steam-power revolutionized the manufacture of woolen goods. A woman could card one pound of wool a day by hand, spin two skeins of yarn, and weave two or three yards of cloth. Now, by the use of machinery, one worker can card 150 pounds of wool, spin 500 pounds and weave from 35 to 50 yards of cloth in a day. The amount of wool produced throughout the world one year was estimated at 2,643,533,794 pounds, nearly half of which came from Australasia, South America and South Africa. Australasia then produced 400,000,000 pounds; Argentina 370,000,000; Russia 361,100,000; the United States 291,783,032; Great Britain and Ireland 133,124,762; Spain 102,600,000; and South Africa 100,000,000. Great Britain has been the largest producer of woolen goods, but the manufacture is growing rapidly in the United States both in extent and in the quality of the goods.

Wool'en Manufacture. With the introduction of power-machinery and the factory-system a great impetus has been given to the manufacture of woolens as well as worsteds in this and other countries; while in recent years there has also been a large increase in the wool-crop and other raw material, raised not only on the North American continent but in other continents and countries, as Australia, South Africa and South America. As the material of which articles of clothing are made, the use of wool dates from early historic times. It is known to have entered into fabrics worn by the ancient Jews as well as by the Greeks and Romans. To-day woolen manufacture is an extensive industry in this and European nations. Early in the 18th century it found seat in Yorkshire, England, where carding, knitting, spinning, weaving and the various processes of cloth-finishing were actively and profitably engaged in. In the production of woolen goods in the United States we have the advantage not only of possessing, annually, large crops of wool besides extensive importations from abroad (the total available United States wool-product, domestic and foreign, amounted in 1905 to about 500 millions pounds' weight, the domestic production in 1906–7 being 298,715,130 pounds), but of having well-nigh numberless looms, with improved and often ingeniously devised machinery for the now vast local production and the utilizing of what is termed waste.

T. D. WOOLSEY

Woolsey (*wo͝ol'sĭ*), **Theodore Dwight**, an American scholar, was born at New York City on Oct. 31, 1801. He studied at Yale, at Princeton and for three years in Germany. He became professor of Greek at Yale College in 1830, and from 1846 to 1871 was president. He was an authority on questions of international law, on which he published a volume. He also edited in Greek a number of Greek plays, and wrote several religious works. The American company of revisers of the New Testament selected him as their president. He died at New Haven, Conn., July 1, 1889.

Woolwich (*wo͝ol'ĭch* or *ĭj*), a town in Kent, England, on Thames River, about nine miles east of London. It is the seat of the principal arsenal of Great Britain, and has the government's factories for producing war-material of all sorts, except gunpowder. The dockyards have existed since 1515, and some of the largest ships of the English navy have been built here. The royal artillery barracks and the Royal Military Academy are also at Woolwich. Population 117,175.

Woon'sock'et, R. I., a city on Blackstone River, 16 miles northwest of Providence. Woonsocket Hill, 580 feet high, the highest point in Rhode Island, is next to the town. It has good schools and a free library, but principally is a manufacturing town, especially of cotton, woolen and rubber goods; it also has a large wringing-machine factory, and ranks as the third manufacturing city of Rhode Island. Population 38,125.

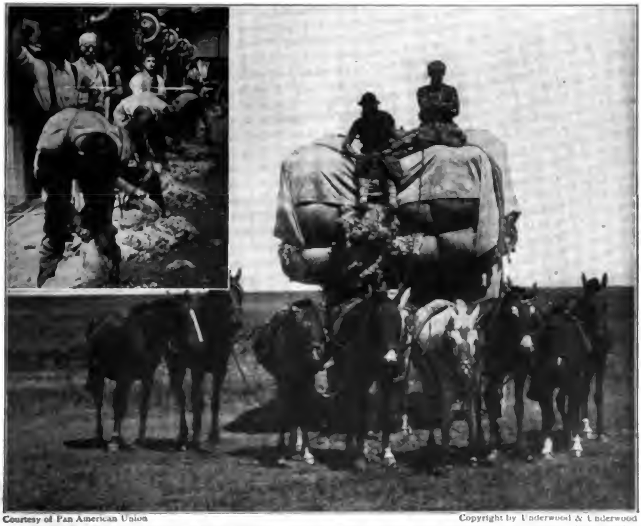
Woos'ter, O., a city, county-seat of Wayne County, 80 miles northeast of Columbus. It is a well-built town, standing on high ground, in a rich farming region. It has factories of agricultural implements, strawboard, whips, organs, furniture, flour, doors, sash and blinds, boilers and engines. Wooster University, founded by Presbyterians in 1866, has three departments, including its medical school at Cleveland, with 41 instructors and 640 students. Other educational institutions are Ohio Agricultural Experiment Station, a high school, elementary school and two libraries. Population 6,136

Wooster, David, an American general, was born at Stratford, Conn., March 2, 1710. He was in the naval service in command of a vessel to protect the coast in the war between England and Spain, and had com-

STORY OF WOOL, FROM SHEEP'S BACK TO WOVEN FABRIC

Courtesy of Pan American Union

A SHEEP FOLD. One of the great industries of the world is the raising of sheep to provide wool for the manufacture of woolen goods. While sheep are raised in every country, and in all parts of every country, the great flocks are found in the western part of the United States, in South American countries, in Australia and South Africa. The picture shows a flock of French Merinos. This is one of the most popular of the breeds for the production of fine wool, suitable for clothing. Other breeds, which are bred for mutton as well as the production of wool, come chiefly from Great Britain and are classed as long wool and short wool breeds.



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SHEEP SHEARING BY MACHINERY. On the left side we have a picture of sheep shearing by machinery. On the larger sheep ranches the method of shearing the sheep by power is being introduced. The new method has several advantages over hand shearing; the process is much faster and therefore more economical; the fleece is taken off cleaner, weighs more and is in better condition; and the shearing is more humane, there being no nicking of the sheep.

TAKING THE WOOL TO MARKET. In the lower picture we have a scene from Argentina, in South America, where there are immense ranches devoted to the sheep industry. The wool is clipped from the sheep in a single fleece. This is rolled and a large number of the rolls packed together in a single bale. These bales are carried by wagons to the nearest railroad point, from whence the wool is carried to Buenos Ayres for shipment to other countries.

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SORTING RAW WOOL INTO GRADES. We now follow the wool into the factory. There are two grading processes through which the raw wool passes before being spun into yarn. The first is the sorting of the wool as shown in the picture. This may be termed a grading for quality. The second process is the combing, which may be termed a grading for fiber length. Wool comes to market in fleeces, just as it is sheared from the sheep.

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CARDING MACHINE. Carding the wool, formerly done by hand, is now accomplished by machinery, the carding machine consisting of a series of rollers which are covered with teeth. The rollers are of different sizes, set at different distances and revolving at different speeds. The raw wool is fed into the machine at one end, and by action of the rollers the fiber is combed and straightened and finally delivered in the form of a fluffy woolen rope, which you see coming out of the front end of the machine.

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SPINNER. Here we have a view of a spinning room. The carded rolls are here spun into threads, which are later woven into cloth or twisted into yarn, as desired. In the various improvements of spinning machinery, the object has been to invent devices for working a large group of spindles together and running them at a very high speed.

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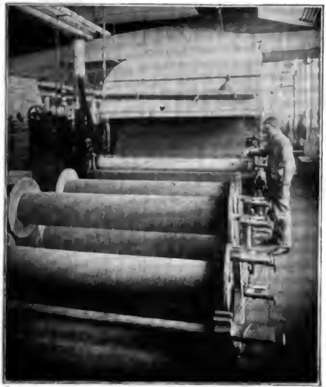
TWISTER. This machine is called a twister and here the threads are drawn from the carded rolls and are twisted into yarn. Twisting is a part of the spinning process proper, which, in making worsteds, consists in first drawing out or drafting; second, twisting the drawn-out fibers; and third, winding the fibers now called yarn, on the bobbin.



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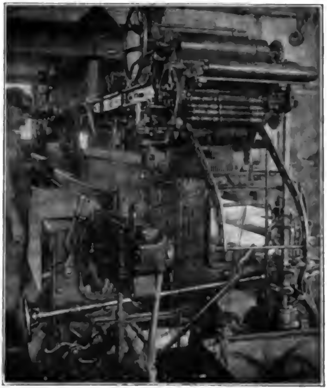
SLASHING MACHINE This is a machine for sizing the threads. In a slasher, the threads from a number of warping beams are first combined into one sheet and then plunged into a trough filled with size which is kept at a boiling temperature, and next squeezed between two pairs of rollers The sheet of yarn almost encircles two steam-heated cylinders. This quickly dries the yarn. The yarn is next measured, passed above and below rods which separate the threads which are wound upon a loom beam.



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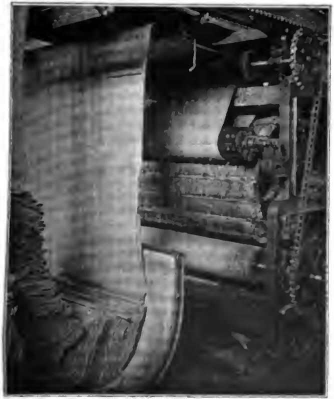
THE LOOM. The first loom was set up in Dantzig in 1661. To prevent such a machine from injuring the poor people the authorities in Poland suppressed it and privately strangled or drowned the inventor In 1733 John Kay, of England, invented a fly shuttle. Before Kay's time, the shuttle was shot by hand across and through the warp threads from side to side. Kay's loom forms the basis of all modern power looms. The above picture presents the marvelously ingenious power loom of the present day.



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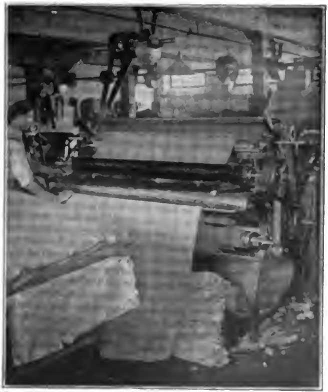
TEASELING MACHINE. This machine takes its name from the teasel, a plant which has a large flower-head covered with a stiff, prickly bur. This is used for raising the nap on woolen cloth. In the center of the machine is a large cylinder, as we see here, which carries little hooks like a teasel bur, for raising the nap on woolen cloth. As we see here, the cloth is passed over this cylinder and descends in folds.



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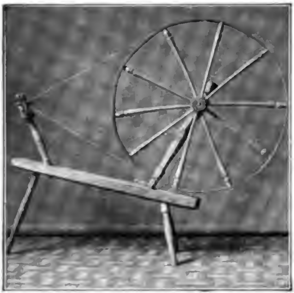
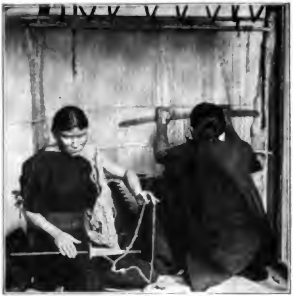
SHEARING MACHINE. This is a machine for cutting off the nap that is too long, making it smooth and even.



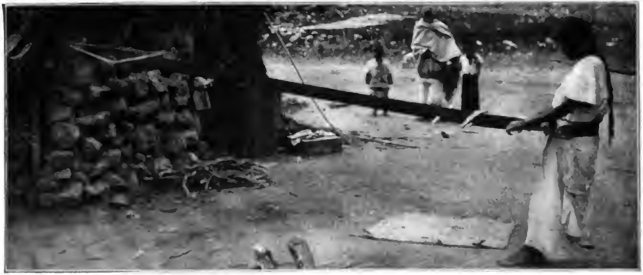
Courtesy of National Museum

SPINNING WHEEL. This is the old spinning wheel, once in use in nearly every farmhouse, where they raised their own wool, spun their own yarn and made their own cloth with a hand loom. With the pin shown lying on the frame, the spinner whirls the wheel with her right hand and with her left feeds onto the spindle the loose rolls of wool, as they come from the cards. The spindle revolves at a high rate of speed, twisting the loose rolls into a hard yarn.



Courtesy of National Museum

WEAVING A NAVAJO BLANKET. Here we see Navajo Indian women weaving the famous Navajo blankets. They are woven in a simple loom, shown above, and formerly were colored in most pleasing and intricate designs of various colors by native dyes of delicate tones. Recently the Navajo women have learned to use the bright aniline colors of the white man, which makes a far less beautiful and artistic product.



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WEAVING THE SERAPE IN MEXICO. The serape is a shawl or blanket worn as an outside garment by the Mexican Indians. It is woven in strips, each strip of a different color, and joined together in one whole. The weaving is of the simplest kind, nothing which could be called a loom being used, and yet the process is in principle the same as that of the modern loom. As can be seen in the picture, the warp threads are held taut by the weight of the woman's body thrown on the broad belt surrounding her waist. She has just shot the weft and is pulling it up close.

Courtesy of Pan American Union

LLAMAS IN PERU. The above is a picture of a group of llamas. The llamas and the alpacas are found in the high Andes of Peru. These were the wool producing animals of the Incas, and are yet of most of the people of the Andes and the western coast of South America. The wool varies in length from two to six inches and is of a lustrous, fine quality, mostly white, black or gray.

mand of a war vessel on the expedition to Louisburg. He was in active service during the French and Indian War, and in the Revolutionary War had command in Canada after the death of Montgomery. When the British invaded Connecticut in 1777, Wooster attacked them at Danbury and was mortally wounded on April 27, and died on May 2, 1777. Wooster, O., was named for him. A monument to him was built by Connecticut.

Worcester (*wŏŏs'tẽr*), a city of England, is on Severn River, about 26 miles from Birmingham. It is an old town, smelting-works in the neighborhood being thought to date back to the time of the Romans. The cathedral, one of the noted ones of England, dates from 1084. It was much injured in the Civil War, but has been restored at great cost. Of the industries the most important are glove-making and the manufacture of porcelain, royal Worcester ware being celebrated for fine designs and beautiful execution. Other manufactures are those of leather, horse-hair weaving, vinegar, wine and engines. Population 46,624.

Worcester, Mass., one of the county-seats of Worcester County, 40 miles southwest of Boston. It ranks next to Boston in population and is a beautiful city, with wide, shaded streets, public parks and fine buildings. The city expends the sum of $646,262 on its public schools, which have a force of 628 day-teachers and 117 night-teachers and an enrollment of 26,360 pupils. Among the higher educational institutions are Clark University, founded in 1888, for strictly graduate work; Clark College, founded in 1902, its trustees being those of Clark University; Worcester Academy; the Free Institute of Industrial Science; the College of the Holy Cross (R. C.); and Polytechnic Institute. The public library; the American Antiquarian Society, with a fine library; the state insane asylum, one of the finest buildings in the country; and the soldiers' monument by Rogers are other noticeable features. The city is extensively engaged in manufactures, as boots and shoes, machinery and machinists' tools, stoneware, jewelry, carpets, machine-needles, awls, wirework, cotton-thread, blankets, felt, water-meters, horse-collars and nails. Worcester was settled in 1713. Population 145,000.

Worcester, Dean Conant, assistant-professor of zoology, University of Michigan, 1895–9, and a member of Philippines Commission of 1900, was born at Thetford, Vt., Oct. 1, 1866, and graduated from the University of Michigan in 1889. In 1887 and in 1890 he was a member of the Steere and of the Menage Scientific Expedition to the Philippines, in both of which he studied their fauna and other scientific features of the islands, as also the existing conditions of the people. In 1900 he was appointed a member of the U. S. Philippines Commission and wrote *The Philippines and Their People*, *The Non-Christian Tribes of Northern Luzon*, and *The Philippines, Past and Present*. He also made the birds and mammals of the Philippines the subject of valuable papers.

Worcester, Joseph Emerson, an American lexicographer, was born at Bedford, N. H., Aug. 24, 1784, and died at Cambridge, Mass., Oct. 27, 1865. In 1811 he graduated at Yale, and in his early career wrote several geographical and historical textbooks, together with one or two popular dictionaries. His chief work in lexicography, however, was the quarto *Dictionary of the English Language*, which first appeared in 1860 and met with much success.

Word'en, John Lorimer, American naval officer, was born at Ossining, N. Y., on March 12, 1818. In 1835 he entered the navy as a midshipman and eleven years later gained a lieutenancy. Early in 1861, after bearing dispatches to Fort Pickens, he was captured by Confederate troops. Towards the close of the year he was exchanged, and subsequently took part in superintending the construction of *The Monitor* (*q. v.*). When that famous ironclad was completed, Worden was given command. At Hampton Roads, on March 9, 1862, he gave battle to the Confederate ram *Merrimac* (or *Virginia*), then endeavoring to destroy northern warships. In the historic encounter between the two vessels neither was seriously injured, though a hot cannonade was maintained for two hours and over, in which Worden was temporarily blinded by the explosion of a shell on the pilot-house of *The Monitor*. Receiving the thanks of Congress for his service on the occasion, the captain also obtained a step in rank, while he was transferred to the command of *The Montauk*. On the latter ironclad Commander Worden destroyed the Confederate privateer *Nashville*, which had taken shelter under the guns of Fort McAllister, and later took part in the bombardment of Charleston (April 7, 1863). He subsequently was on special duty at New York City, and, as commodore, was head of the Naval Academy from 1870 to 1874. In 1872 he was commissioned rear-admiral, and in 1886, at his own request, he was retired. He died at Washington, D. C., on Oct. 18, 1897.

Words'worth, William, an English poet, was born at Cockermouth, Cumberland, April 7, 1770. He studied at Cambridge, and traveled in France, where he sympathized strongly with the Revolution, but fortunately was compelled by his friends to return home in October of 1792 before his Girondist friends were sent to the guillotine. His first publications, in 1793, were two poems: *An Evening Walk* and *Descriptive Sketches*, which made little impression upon the public, but won the recognition of Coleridge and the friendship of Calvert, who at his death in 1794 bequeathed $4,500 to the poet, that he might carry out his desire to devote himself to poetry. He settled (1797) with Dorothy, his sister and lifelong companion, at Alfoxden in Somerset, to be near Coleridge. *Lyrical Ballads* was the joint production of the two poets, but brought Wordsworth no nearer to public recognition. Sure of himself, he continued his work, publishing several volumes that were the laughing-stock of some critics; the works of Southey and Coleridge, forming with Wordsworth the Lake School, as it was called, coming in for their share of ridicule. Wordsworth's home was now (1813-50) at Rydal Mount, in the Lake District of England. A claim of the family against Lord Lonsdale was paid, and a county-office with a small salary was secured for the poet, so that he was able to marry and give himself wholly to his literary work. Gradually a select circle of admirers, Leigh Hunt, De Quincey, Wilson and others, made the poet appreciated, and when his *Excursion* appeared (1814), his genius was acknowledged. From that time it grew, until he ranked as the first poet of his day. He received a pension of $1,500 in 1842, and in 1843 became poet-laureate. *The Excursion* and *The White Doe of Rylstone* are his only long poems. His shorter pieces, as *Intimations of Immortality*, *The Skylark* and *The Daisy*, with his sonnets, are the most popular poems. Some of his early poems, as *The Idiot Boy* and *Alice Fell*, still provoke a smile and in some degree justify the ridicule of critics. Wordsworth died on April 23, 1850. He was a prophet of nature and a revealer of the grandeur of simple human nature, and he stands fourth or fifth among the great poets of England. Consult Dowden's edition (1892) of his poems or Knight's (1896), his prose also having been edited by Knight. Myers' *Wordsworth* in The English Men of Letters Series is the best life for the student. The essays of Matthew Arnold, Stopford Brooke, Russell Lowell and Principal Shairp are great helps to understanding Wordsworth. So are *Studies in Wordsworth* by Hudson.

World's Fairs. See EXPOSITIONS.

Worms (*vōrms*), a town in Hesse-Darmstadt, on the Rhine. It is one of the oldest cities in Germany and is the scene of the *Nibelungenlied*. Held by the Romans, destroyed by Attila, rebuilt by Clovis, the residence often of Charlemagne and his successors, it was made a free imperial city by Emperor Henry V. Many German *diets* (national assemblies) were held here, the most famous being the one when Luther defended his work as a reformer before Charles V. During the middle ages it was a large city with extensive trade, but was almost destroyed by the French in 1689. Among its ancient buildings is the cathedral founded in the 8th century. Tobacco, leather and wine are the principal manufactures. Population 43,841.

Worms. See VERMES.

Worth of Foreign Coins in American Money. (It is impossible to obtain absolute accuracy. It also should be remembered that the constant fall in the price of silver lessens the value of silver coins. The values are approximate).

NAME	METAL	COUNTRY	VALUE
Anna	[Money of account]	India	2¢
Argenteus	Silver	Rome (ancient)	25½¢
Argentine	Gold	Argentine Republic	$4.85
As	Copper	Rome (ancient)	1c to 12½¢
Aureus	Gold	Rome (ancient)	$4.50
Bolivar	Silver	Venezuela	19½¢
Boliviano	Silver	Bolivia	97¢
Cash	Copper	China	⅒¢
Centavo	Copper and nickel	Mexico	1¢
Centesimo	[Money of account]	Argentina	1¢
Centesimo	Copper	Italy	⅕¢
Centesimo	[Money of account]	Spain	⅕¢
Centime	Copper	France	⅕¢
Condor	Gold	Chile	$4.56
Condor	Gold	Ecuador	$4.87
Conto	[Money of account]	Portugal...$1,078...and Brazil	$546.00
Crore	[Money of account]	India	$320,000,000
Crown	Silver	Austria	19½¢
Crown	Silver	England	$1.21
Crown	Gold	Portugal	$10.78
Cuarto	Copper	Spain	¼¢
Daric	Gold	Persia (ancient)	$5.52
Decima	Copper	Spain	5¢
Decime	Copper	France	2¢
Decimo	Silver	Chile	9½¢
Decimo	Silver	Colombia	9½¢
Decimo	Silver	Spain	9¢
Denarius	Silver or copper	Rome (ancient)	17¢
Dinar	Silver or copper	Servia	19½¢
Dinero	Silver or copper	Peru	9⅒¢
Drachma	Silver	Greece	19½¢
Drachma	Silver	Greece (ancient)	17¢ to 9¢
Dubbeltje	Copper	Holland	4¢
Ducat	Gold	Austria	$2.26
Eikosadrachm	Gold	Greece	$3.80
Eikosipentarion	Silver	Greece	.05¢

Name	Metal	Country	Value
Florin	Silver	Austria and England	48½¢
Florin (=guilder)	Silver	Bavaria and Holland	32¢
Franc	Silver	Belgium, France, Switzerland	19½¢
Groat	Silver	England	8¢
Guilder (=florin)	Silver	Holland	32¢
Guinea	[Money of account]	England	$5.09⅓
Gulden (=florin)	Silver	Austria	48½¢
Heller	Copper	Austria	⅕¢
Kopek	Copper	Russia	½¢
Kran	Silver	Persia	19½¢
Kreutzer	Copper	Austria	½¢
Krone	Gold	Austria	$6.64⅓
Krone	Silver	Austria	24⅓¢
Krone	Gold	Germany	$2.38
Krone	Silver	Denmark	25¢
Lac	[Money of account]	India	$320,000
Lei	Silver	Rumania	19½¢
Lepton	Copper	Greece	⅕¢
Lepton	Copper	Hebrew (ancient)	1/10¢
Libra	Gold	Peru	$4.87
Lira	Silver	Italy	19⅓
Lira	Gold	Turkey	$4.32
Livre (=franc)	Silver	France	19⅓¢
Mark	Silver	Germany	23½¢
Medjidie	Gold	Turkey	$4.32
Medjidie	Silver	Turkey	88¢
Milreis	Gold	Portugal	$1.06
Milreis	Silver	Brazil	53¢
Mina	Gold	Greece (ancient)	$19.70
Napoleon (not current)	Gold	France	$3.86
Onlik	Silver	Turkey	40¢
Penny	Copper	England	2¢
Pentarion	Silver	Greece	10¢
Peseta	Silver	Peru and Spain	19½¢
Peso	Silver	Spanish-speaking America	97¢
Pfennig	Copper	Germany	¼¢
Piaster	Silver	Rumania	19⅓¢
Piaster (=peso)	Silver	Spain	97¢
Piaster	Silver	Turkey	4¢
Piataltinik	Silver	Russia	10¢
Pice	Copper	India	¼¢
Pie	Copper	India	⅛¢
Piece-of-Eight	[Money of account]	Spain	40¢
Pistareen (=peseta)	Silver	Spain	19½¢
Polu	Gold	Russia	$7.50
Poltina	Silver	Russia	38¢
Pound (=sovereign)	Gold	England	$4.84 to $4.87
Pound	Gold	Egypt	$4.94½
Purse	[Money of account]	Turkey	$21.73
Quinarius	Silver	Rome (ancient)	8¢
Real	Silver	Spain	5¢
Rei	[Money of account]	Portugal and Brazil	1/20¢ to ½¢
Rap	[Base coin]	Ireland	½¢
Rin	Copper	Japan	1/10¢
Rix-dollar	Silver	Denmark	54¢
Ruble	Silver	Russia	49¢
Rupee	Silver	India	32¢
Scudo	Silver	Italy	97¢
Sen	Copper	Japan	1¢
Sesterce	Silver	Rome (ancient)	4½¢
Sestertium	[Money of account]	Rome (ancient)	$42.94
Shekel	Silver	Hebrew	60¢
Shilling	Silver	England	24¢
Skilling	Copper	Norway	1¢
Sol	Gold	Peru	48¢
Sol or sou (=centime)	Copper	France	1¢
Soldo (=centesimo)	Copper	Italy	1¢
Sovereign (=pound)	Gold	England	about $4.85
Stater	Gold	Greece (ancient) . . $4; Persia (ancient)	$5.35
Stiver	Silver	Holland	2¢
Sucre	Silver	Ecuador	97¢
Tael	[Money of account]	China	79¢
Talari	Silver	Abyssinia	48¢
Talent	Gold	Assyrian (ancient)	$1,550 to $2,000
Talent	Gold	Attic (ancient)	$1,200
Talent	Gold	Babylonian (ancient)	$1,550 to $2,000
Talent	Gold	Hebrew (ancient)	$1,550 to $2,000
Talent	Gold	Roman (ancient)	$500
Taler	Silver	Germany	69¢
Tallari	Silver	Egypt	$1.00
Tical	Silver	Siam	48½¢
Tical	Gold	Siam	$5.00
Triens	Gold	Rome (ancient)	$1.70⅓
Triens	Copper	Rome (ancient)	½¢ to 4¢
Venezolana (or sequin)	Silver	Venezuela	97¢
Victoriatus	Silver	Rome (ancient)	12½¢
Vintem	Copper	Portugal	2¢
Yen	Silver	Japan	48½¢

Wren, a family (*Troglodytidæ*) of passerine birds. They are sprightly little birds, always in motion. About a half-dozen species are found in the eastern United States. The house-wren nests about yards in any suitable hole or cavity and shows a liking for a bird-box, if it can find one unoccupied. It is a pert, bobbing bird about five inches long, of a brown color above, marked with black and gray, and grayish and rusty below. The winter-wren is smaller, being only four inches long, but of similar appearance to the house-wren. In summer it nests north of New England, but is a common winter resident in the eastern states. It is a fine singer. The long-billed marsh-wren is abundant in reedy swamps, making a big, globular nest with a little hole on one side, all suspended from rushes. The Carolina wren is a remarkable singer. It is a larger bird, reaching a length of six inches; its color is reddish brown above and pale buff below. It ranges through the southern states north to Pennsylvania. The European bird is a small, lively bird, nesting in gardens and hedges, and is a great favorite.

Wren, Sir **Chris'topher,** an English architect, was born at East Knoyle, Wiltshire, Oct. 20, 1631. He studied at Oxford, where he invented mathematical instruments. He also, while residing at Oxford as a fellow, became a member of a society for studying and experimenting in natural philosophy. Evelyn in his *Diary* speaks of Wren at this time as "that miracle of a youth." He made improvements on the newly invented barometer and a globe of the moon, which he finished by order of King Charles II at the request of his scientific friends, who also asked the king to command Wren to continue "drawing the shapes of little animals as they appear in the microscope." He was professor of anatomy at Oxford and at London, and with others formed the Royal Society. He had already made plans for the restoration of St. Paul's Cathedral in London, when it was destroyed by the fire of 1666, but in 1675 the new building was begun under his direction, and in 1710 the last stone was laid by his son. Other buildings planned by Wren are the Royal Exchange, Temple Bar, the customhouse and fifty churches in London; Gateway Tower and Christ Church, Oxford; Pembroke College, Cambridge; the Royal Observatory at Greenwich; Buckingham House; and the towers of the western front of Westminster Abbey. He died on Feb. 25, 1723, and was buried at St. Paul's. His tomb has the inscription: *Si monumentum quæris, circumspice* (If you seek his monument, look around). Steele has introduced him in *The Tatler* in the character of Nestor.

Wres'tling, one of the favorite forms of athletic exercise and feats of skill and strength in Greece in early times and a special attraction in contests at the Olympian and Isthmian games. In these early encounters grace of movement on the part of the wrestlers was in some degree as essential to success as was the throwing of an opponent to the ground. From Greece wrestling-matches passed to Italy, and in later times they have become common in England and in this country; while they are a notable feature (known as *jiu-jitsu*) in athletic contests in Japan. The Greco-Roman manner of wrestling has long been the rule in France, as it is in England and here; though tripping, commonly engaged in by modern wrestlers, was not permitted in ancient wrestling encounters. A fall is constituted by both shoulders and one hip or by two hips and one shoulder touching the ground. In the rules observed at the English contests in the Cumberland and Westmoreland matches the man who breaks hold, that is, loses his grip on his opponent, is deemed the loser. The Lancashire style, considered the roughest of wrestling contests, permits catching by the legs as well as wrestling on the ground. In French matches tripping is tabooed; while in German ones the contest is chiefly a struggle on the ground.

Wright, Carroll Davidson, American statistician and writer on social science and economics, was born at Dunbarton, N. H., July 25, 1840, and had an academic education. In the Civil War he enlisted in the United States army, and rose to be colonel of the 14th New Hampshire volunteers. In 1872 he became a member of the Massachusetts senate and chief of the Massachusetts Bureau of the Statistics of Labor. During 1885–1902 he was United States Commissioner of Labor, and took part in the labors of the 11th United States census, and in 1895 he became lecturer on social economics in the Catholic University of America. In 1902 he became president of the collegiate department (now Clark College) of Clark University at Worcester, Mass. He has written largely on statistics and on labor, among his published works being *The Factory System of the United States*, *The Relation of Political Economy to the Labor Question*, *Convict Labor*, *Strikes and Lockouts*, *Working Women in Large Cities*, *Railroad Labor*, *Industrial Evolution of the United States*, *Outline of Practical Sociology* and *Annual Reports* (1873-88) *of the Massachusetts Bureau of Statistics*. Died Feb. 20, 1909.

Wright, R. Ramsay, was born in Scotland in 1852; educated at the High School and University of Edinburgh; assistant-professor of natural history, Edinburgh, in 1873; professor of natural history in University College, Toronto, 1874; and its vice-president, 1901. He published

Comparative Anatomy of Vertebrata and *Zoölogy for High Schools.*

Wright, Wilbur. With his brother Orville he was the first to make aviation a practical art and commercial success. They long worked in secret and their ability to fly in a heavier-than-air machine, was doubted until demonstrated in public in this country and in France. Both won many prizes at home and abroad, and in 1909 Congress awarded them a gold medal "in recognition of their courage, ability and success in navigating the air." They abandoned actual flying in 1910 and devoted themselves to the manufacture of aeroplanes. Wilbur Wright died at Dayton, May 30, 1912. He was born in 1867 on a farm in Henderson Co., Ind.

Writ'ing, the expression of thoughts by characters to make them known to others, is found in many forms. The hieroglyphic or pictorial writing, in which the idea is expressed by a picture, which afterward became a sign, was common in Egypt, Assyria and Mexico. The invention of the alphabet, which is the basis of the modern art of writing, is ascribed to the Phœnicians, who are thought to have taken some of the signs used in the hieroglyphic writing of Egypt and made of them the characters which represent the sounds of the voice as we now find them in alphabets. The Latin letters were introduced into England by the Romans, and what is called Roman-Saxon writing prevailed until the Saxon became general in the time of Alfred. Norman writing came with William the Conqueror, and the Gothic, Old-English and English court-hand followed. The direction of the writing varies in different nations; the Mexican picture-writing begins at the bottom, the Chinese and Japanese write in columns, beginning at the top and going from right to left; and Hebrew is written from right to left. The materials used were various, including papyrus, parchment and paper, and the instruments have also varied from the stylus and quill to the modern pen and typewriter. See CUNEIFORM and PENMANSHIP.

Württemberg (*vĕrt'tĕm-bĕrg*), a kingdom of the German empire, is in the southern part of Germany, separated from Switzerland by Lake Constance. Its greatest length is 139 miles and its width 105, with an area of 7,534 square miles. The Black Forest is on the western border; and the Swabian Alps cross the country for 80 miles, dividing it into the valley of the Danube and the valley of the Neckar, which are the principal rivers. The climate is mild in the Neckar valley, but cold in the mountains. It is an agricultural country, with extensive orchards, gardens and vineyards; and the grains, hay and fruits are the main products. There is but little coal, but extensive peat-beds, fire-clay, iron, salt, gypsum and tourmaline are found. In 1905 the value of the mineral products in the kingdom was 3,237,800 marks. The state railways in 1906 had a total length of 1,219 miles. There are manufactures of linen, woolen, cotton and silk goods. Beer-breweries and brandy-distilleries are numerous, and 215,500,000 bottles of beer have been used in a year in the country — 125 bottles for each person. The government is a hereditary monarchy. In the empire Württemberg has four votes in the *bundesrat* or federal council and 17 representatives in the *reichstag* or congress. Education is compulsory, and there must be at least one school in every commune. Recent official reports show that there is no person in the kingdom over ten years old who cannot read and write. The educational system is completed by the University of Tübingen (*q. v.*), founded in 1477. Württemberg joined the German empire in 1871. The capital is Stuttgart (population 285,589). Population of Württemberg 2,435,611

Würzburg (*vürts'bōōrg*), a city of Bavaria, is in a beautiful valley on Main River. Among the noticeable buildings are the episcopal palace, one of the most magnificent royal houses in the world, the large Julius Hospital, the cathedral, rebuilt in the 11th century, and the beautiful *Marien Kappelle*, with 14 statues of the 15th century. The university, founded in 1582, has medical and law schools and musical departments, the medical school being connected with the hospital and having a high reputation. There also are gymnasial, agricultural and trade schools and a Roman Catholic seminary. The manufactures are woolen goods, mirrors, leather, tobacco and wines. Population 84,387.

Wu, Ting Fang, Chinese diplomat and statesman, was born near Canton in China in 1842, and educated at St. Paul's College in Hong Kong, where he practiced for a time as a lawyer and acted as interpreter in the law-courts for the provincial government. From 1874 to 1877 he was in England, where he studied law at Lincoln's Inn, London, and was called to the English bar. On his return to China the Peking government became interested in him, and through the influence of Marquis Li he was appointed a member of the latter's official staff, and later took part in effecting the treaty of Shimonoseki, which concluded the Chino-Japanese War. At Peking he served in other official capacities until 1896, when he was appointed minister to the United States. In the latter capacity, while in this country, he unsuccessfully opposed the re-enactment, without modifications, of the Chinese Exclusion Act. In 1902 he returned to China, being summoned to aid in negotiating commercial treaties with the United States and other nations; and in the following year he was named vice-president of the Board of Commerce newly organized by the Chinese Government at Hong Kong. In 1908 he was again appointed minister to the United States.

Wy'andots', a tribe of American Indians of the Iroquois family, found originally around Lake Huron. They were called Tobacco Indians by the French, because of the large quantity of tobacco raised by them. They were nearly exterminated by the Iroquois, the survivors finally settling in Michigan, mainly around Detroit, where they furnished the English with 600 warriors in the War of 1812. They settled later along Sandusky River in Ohio, but sold their lands to the United States and moved to Kansas.

Wy'andotte Cave, a curious cave in Indiana, four miles from Leavenworth. It is 22 miles long, and the two largest rooms are 245 feet high. In Mammoth Hall is a mound 175 feet high, with three statues, one called Lot's Wife. The dome is 70 feet from the top of the mound. The White-Cloud Room, Beauty's Bower and the Pillared Palace are other points of interest, all beautifully decorated with crystals, thought by many to exceed in beauty those of Mammoth Cave, Ky.

Wyant (*wī'ant*), **Alexander Helwig,** an American artist, was born at Port Washington, O., on Jan. 11, 1836. After trying the saddlery business, he turned to art, went to Europe in 1865, and became a pupil of Hans Gude at Karlsruhe. He painted American landscapes almost exclusively, being particularly successful in views of the Adirondack wilderness, and gained high standing. His characteristics were subtlety of tone, delicacy of workmanship and ability to catch nature's evanescent moods. Among his pictures are *A Pool on the Ausable* (in the Adirondacks) and *An October Day.* He died at New York City in 1892.

Wy'att, Richard John, an English sculptor, was born at London, May 3, 1795. He studied at London and Paris and at Rome in the studio of Canova. His favorite subjects were classical. *Penelope*, *Ino and Bacchus* and *Eucharis and Cupid* are some of his best-known works, whose delicacy and finish placed him in the front rank of English sculptors and gained the highest medal for sculpture at the great exhibition in 1851, though he had died at Rome, where he resided, May 29, 1850.

Wyatt, Sir **Thomas,** an English poet, was born in Kent in 1503. He studied at Cambridge and held a position at court under Henry VIII and at Anne Boleyn's wedding. He was English ambassador at the court of Charles V, and on his return lived at Allington in retirement. His poems were published with those of Surrey in 1557. With Surrey he shares the honor of introducing the sonnet (*q. v.*) into England, and his love-poems are among the sweetest of the time. He died on Oct. 11, 1542.

Wycliffe (*wĭk'lĭf*) or **Wiclif, John,** an English reformer, was born near Richmond in Yorkshire between 1324 and 1329. He studied at Oxford, was master of Balliol Hall, since Balliol College, and finally (1374) rector of Lutterworth in Leicestershire. His first oposition to the church was shown in contending for the king against the papal claim to certain tribute-money. In 1374, on a visit to Bruges, where he was sent to confer with the papal legate, he seems to have been confirmed by what he saw in his opposition to the pope. His opinions brought him into trouble, as he was summoned in 1378 before a religious body, but a London mob burst into the chapel and stopped the proceedings. The pope issued *bulls* (papal decrees) against him, and he was again summoned to Lambeth, but escaped with an injunction to be careful what he preached. He began translating the Bible, sending copies of parts of it from village to village. He had a large following, the Lollards, as his disciples were called, being found in all ranks of the people. He was again summoned before the church tribunal, his works condemned to be burned, and he himself banished from Oxford to his parish at Lutterworth. He died on Dec. 31, 1384. His bones were taken up in 1428 by order of the Council of Constance (1415), and burned, and the ashes scattered into the river Swift, a branch of the Avon. Besides his Bible, which was the first English version, he wrote a large number of tracts, over 200 being burned in Bohemia. He was the father of English prose, his translation of the Bible making practically the language that was used by Tindale and his successors in their versions. Historically he is called The Morning-Star of the Reformation, for his works made Hus (*q. v.*) of Bohemia a reformer, and the writings of Hus powerfully influenced Luther (*q. v.*). Consult Burrows: *Wiclif's Place in History;* Lechler: *John Wiclif;* Loserth: *Hus and Wiclif;* Sargeant: *John Wyclif;* Stanley Lane Poole: *Wycliffe;* and Trevelyan: *The Age of Wycliffe.*

Wycliffe College, Toronto, Can., was established in 1877 under the name of the Protestant Episcopal Divinity School. In 1890 the college was federated to the University of Toronto. The college was in 1891 transferred to new and commodious quarters. Through representation in the university's senate it secures a share in administration. The greater part of the students take their arts course in the university and in University College. Degrees in divinity are conferred. It has about 50 students (a three-year theological course) on its roll, and has sent out 150 graduates. The first foreign missionary sent by the Church of England in Canada went from Wycliffe College.

Wyom'ing, a western and central state of the Union, occupies the northwestern portion of the Rocky Mountains in the United States. The state is bounded on the north by Montana, on the east by Nebraska and South Dakota, on the west by Montana, Idaho and Utah and on the south by Utah and Colorado. The capital is Cheyenne (population 11,320). The other chief towns are Laramie (8,237) and Rock Spring (5,778). Population of the state 182,264.

Surface. Wyoming is broken into a number of spurs or ranges, including the Snow and the Shoshone Mountains in the northeast, within which is the famed Yellowstone (*q. v.*) Park, with magnificent canyons and geysers. Southwestward lie Salt River, Teton and Gros Ventre Ranges, Wind River Range, Sweetwater Mountains and Laramie Range; while south and southwest are Medicine Bow Mountains and Quien Hornet Mountain; in the northern section of the state are Big Horn Mountains and east of them Bear-Lodge Mountains. Other elevations embrace Rattlesnake Range, the Green Mountains, the Powder River Range, the Bearspaw and Little Belt Mountains, each with its notable peaks, soaring here and there throughout the state from its 4,000 to 7,000 average elevations to a height of from 13,000 to close upon 14,000 feet. The slopes of these elevations are clad with forests, the timbered area being estimated at 12,500 square miles. The area of the state exceeds that of Oregon, being 97,890 square miles, with a length of 275 and an extreme breadth of 365 miles.

Climate and Drainage. With its high average elevation, extensive mountain-ranges and its extremes of temperature in winter and summer and with insufficient rainfall, Wyoming is not well-adapted for agricultural operations. The climate, though dry and bracing, has extremes of temperature ranging from 120° F. in summer to 44° F. *below* zero in winter. In the north the mean average in January is 18°, and in the south it is 25°, with about 67° for both regions in summer. Though thus unsuited in large part for farming, the state nevertheless has extensive pasture-lands available for stock-grazing on the plains, though not a few are arid, with sandy soil, responding indifferently or not at all to irrigation. Ranching perhaps is best suited to the prevailing conditions, though coal-mining, oil-production and lumbering are the chief industries. Wyoming is further handicapped by indifferent railway facilities and by lack of navigable rivers. Its chief streams, except those that have their outlet into the northern fork of Platte River, drain for the most part into rivers lying outside the state, as the Yellowstone in Montana, the Missouri in South Dakota and the Colorado in Utah. In the north the region is drained by the Yellowstone, with its tributaries of Big Horn, Tongue and Powder Rivers; in the south and east central region the drainage is effected by the northern fork of the Platte, with its tributaries of the Laramie, the Sweetwater and the Cheyenne; and in the southwestern section the principal stream is Green River, which drains into the Colorado. The chief lakes are the Yellowstone, lying within the park, and the Jackson, which is traversed by Snake River.

Natural Resources. Although the facilities for getting the products to market are as yet inadequate, Wyoming stands twelfth in rank among the states producing bituminous coal. The other important mineral products are copper, gold, extensive fields of petroleum, soda, asbestos, lead, silver, gypsum, stone, potter's clay, iron beds and ores of high quality.

Agriculture. Wyoming leads all other states both in number of sheep raised and the value of the wool clip. It has more than one-eighth of the total number of sheep in the United States and these are one-seventh in value. Farm products include hay, potatoes, oats and corn, but the principal cereal crop is oats. There are over 6,000,000 acres of irrigable land in Wyoming which settlers are rapidly developing on favorable terms, aided by government irrigation works. Experience has shown that where the valleys and plateaus between the mountain ranges are properly irrigated the fertile soil yields abundant crops, and irrigation ditches extend far into these regions.

Forests. Thirteen per cent of the total area of the state is occupied by forests. The trees suitable for lumber are chiefly yellow pine, although there are a few other cone-bearing trees and some hardwood varieties. Of the total forest area of the state, however, upward of 3,500 square miles are in the Yellowstone National Park, and something over 5,000 square miles in the Big Horn and Medicine Bow Mountains.

Transportation. The railway mileage is 1,644 miles. The Union Pacific traverses the southern part of the state, while the Chicago, Burlington and Quincy traverses its northeast corner. The Chicago and North-Western railroad, entering from the east, taps the center of Wyoming; while a junction is effected with this road from the south by the Colorado and Southern railroad.

Manufactures. The manufacturing interests of Wyoming are but slightly developed at present, the number of industrial establishments being only 268, with an aggregate capital amounting only to $6,195,000; 2,867 wage-earners; and total products of the value of

$6,249,000. The principal industries embrace flour and grist mills, printing and publishing establishments and railroad repair-shops.

Education. With a school population sparsely scattered over the state and not over 33,000 in number, there are 24,584 pupils at present enrolled in the public schools, while the average daily attendance is limited to 16,673, with 1109 teachers. There are also 1,442 students enrolled in the high schools of the state. Higher education is represented by the University of Wyoming at Laramie, with 40 instructors and 300 students. The institution, besides a normal school department, has schools of agriculture, mining, commerce, mechanical engineering and music. Of penal and charitable institutions the state maintains a hospital at Rock Spring, with an auxiliary branch at Sheridan, an insane asylum at Evanston and a penitentiary at Rawlins.

History and Government. Though Wyoming (a part originally of the Louisiana Purchase of 1803) was by Congressional Act erected into a territory in 1868, the region in early days was visited by hunters and fur-traders; while explorers, as Verandrye in 1743-4, are known to have gone over the district in pioneering expeditions and in search of game and furs even before the middle of the 18th century. Early in the 19th century trappers from Montana are also known to have visited the Yellowstone region and gone as far inland as Laramie Fork of Platte River, where a fort was built in 1834, which in the following year was acquired by the American Fur Co. and later sold to the Federal government. Captain Bonneville and General Frémont, moreover, were among those familiar with the region in the thirties and forties. Settlement, however, was slow. Indeed it did not begin to be made until the passing through of the Mormons on their way to Utah and the subsequent finding of gold in the valley of Sweetwater River, aided by the construction of the Union Pacific. In 1867 Cheyenne began to be settled, in 1868 Wyoming became a territory, and in 1869 Cheyenne became the capital. Before this there had been trouble with the Sioux, who resented the coming of white settlers. Subsequently the Indian difficulties were settled, reservations were assigned to the tribes, and about one and a half million acres were bought from the Shoshones and other natives and thrown open to settlement. Forest-reserves were also set apart in Yellowstone Park and othersections, and a chain of forts was erected by the government for the security of the region and the protection of the incomers and settlers. The population having grown, especially in the south the movement originated to form a constitution and apply for statehood. This occurred in 1889, and on July 10, 1890, Wyoming became a state. Wyoming sends a single member to the lower House of Congress. Its chief executive officers besides the governor include a secretary of state, a treasurer and a superintendent of public instruction. Consult *Resources of Wyoming;* Bancroft's *Nevada, Colorado and Wyoming;* and U. S. Geological and Geographical Survey Reports.

Wyoming Valley is a beautiful valley on Susquehanna River in Luzerne County, Pennsylvania, inclosed by mountains. During the Revolutionary War 400 British troops, with 700 Indian allies, entered the valley, where there was a town of 2,000 inhabitants. Many of the defenders of the place were absent in the Continental army, and only 300 men could be gathered to meet the attack. After a desperate struggle, July 3, 1778, they were driven back to the fort, which surrendered on July 5, when the Indians indiscriminately massacred all who could not escape by flight. Campbell has preserved the story in his poem of *Gertrude of Wyoming.* It is now thought that Brant, the Mohawk chief, according to Campbell one of the chief actors, was not present at the attack. In 1843 a monument was erected on the battlefield. Consult Peck's *Wyoming.*

X

X (*ĕks*), the twenty-fourth letter, is a double consonant or, rather, a superfluous sign for the compound consonants *gz* and *ks*, as in *exist*, *wax*. *X*, when followed by an accented syllable beginning with a vowel, or when followed by silent *h* and an accented vowel, is *gz*, as in *exalt*, *exhort*. But in a few exceptions to this rule and in other words *x* is *ks*, as in *exar′chate*, *excellent*. X at the beginning of words has the sound of *z*, as in *xebec*, and in some compounds keeps the *z* sound, as in *metaxylene*. Final *x* always is *ks*, as in *ax*.

Xanthippe (*zăn-tĭp′pē*), the wife of Socrates (*q. v.*), has the reputation of being an archtermagant, doubtless with some reason. Still it should be remembered that her naturally infirm temper must have been severely tried by the small concern manifested by Socrates in relation to his domestic affairs. Socrates had completely mastered his naturally strong appetites and passions and had acquired a temper of perfect serenity. It is but natural then that historians, on ever so small a basis of fact, should delight to match such a philosopher with a woman of such a temper as Xanthippe is said to have possessed. On the other hand, if we can trust Plato, she seems to have really loved her husband, and at his death he tenderly committed her to the care of his friends. Many stories are told of her to illustrate her peculiar infirmity, but it is impossible to tell how much credit should be given to them. The era of Socrates was 470–399 B. C.

Xavier (*zăv′ĭ-ĕr*), **Saint Francis, The** Apostle of the Indies, one of the first members of the *Societas Jesu* (Jesuits), was born at Navarre, Spain, April 7, 1506. He was educated at Paris, graduating in 1530. Soon afterwards he joined the order formed by Ignatius Loyola, and on Aug. 15, 1534, took vows with five others, devoting themselves to missionary work in Palestine. War prevented them from carrying out this plan. When Loyola was requested to send missionaries to the Portuguese settlements in the Indies, Xavier was selected, and with one associate set out from Lisbon in 1541. He went first to Goa, to Ceylon, to Malacca and then to Japan. He intended next to go to China, but died when only in sight of that empire, Dec. 5, 1552. He was buried at Goa. It is said that during his ten years' apostleship, he planted the faith in 52 different kingdoms, preached the gospel through 9,000 miles of territory, and baptized more than 1,000,000 persons. He was canonized by Pope Gregory XV in 1622.

Xenia (*zē′nĭ-ȧ*), **O.**, county-seat of Greene County, is a flourishing city, midway between Cincinnati and Columbus, on the Pittsburg, Cincinnati, Chicago and St. Louis Railway. The industrial establishments embrace marble and granite works, manufactories of rope, cordage, twine, shoes, paper-board, sawmills, planing-mills and a handle-factory. Besides its various manufactories and other enterprises it is the seat of the theological seminary of the United Presbyterian church and of the Ohio Soldiers' and Sailors' Orphans' Home. Wilberforce University, an institution for the education of colored youth of both sexes, is located three miles from the city. Population 8,706.

Xe′non. See ARGON.

Xenophon (*zĕn′ō-fŭn*), a Hellenic general, historian and philosopher, was born at Athens in 430 B. C. At an early age he became a pupil of Socrates, and is said to have been saved from death by that philosopher at the battle of Delium. At 40 he joined the expedition of Cyrus the Younger (*q.v.*) against Artaxerxes Mnemon, king of Persia, and after the battle of Cunaxa and the treacherous murder of the Greek generals played an important part in the Retreat of the Ten Thousand. Soon after his return to Greece he settled in a small town in Elis, where he lived for over 20 years, occupying himself in agriculture and literary pursuits. He is supposed to have died at Corinth in 355 B. C. Xenophon's principal works are *The Anabasis*, a history of the expedition of Cyrus and the Retreat of the Ten Thousand; *The Cyropedia* or education of Cyrus and *Memorabilia*, a series of dialogues intended to refute the charges on which Socrates was condemned to death.

Xerophytes (*zē′rō-fīts*), plants adapted to dry soil and air. The conditions of drouth may be occasional, periodic or permanent, and plants have various ways of meeting them. The plan is to avoid as much exposure as possible and to store what water can be obtained. Prominent among drouth adaptations are underground habits (geophilous plants), rolling or folding of leaves, profile position of leaves (compass-plants), motile leaves which can shift their position (sensitive plants), small leaves etc. Probably the most conspicuous feature of plants in permanently dry regions is the organization of reservoirs which retain water and dole it out, according to the need. Such plants, therefore, usually are fleshy or succulent. The xerophytic societies are numerous, and among them may be mentioned rock societies, composed of plants living upon exposed rocks, walls etc.; sand societies, including beaches, dunes and sandy fields; shrubby heaths, in which species of the heath family abound; plains, the great dry areas in the interior of continents; cactus deserts of the southwestern states and Mexico; and tropical deserts, where the drouth conditions are extreme and the vegetation scanty.

Xerxes (*zẽrks′ēz*) **I**, king of Persia, was the oldest son of Darius by Atossa, his second wife, and was appointed successor by his father in preference to Artabazanes, his oldest son by his first wife. Darius died in 485 B. C. in the midst of preparations for a third expedition against Greece; and Xerxes, as soon as he had subdued the rebellious Egyptians, gave his whole attention to the completion of his father's plans for the subjugation of the Hellenic states. A bridge of boats a mile in length was built across the Hellespont; and a canal was cut through Mt. Athos, near which the fleet of Mardonius had been wrecked in 492 B. C. In the spring of 480 B. C. the vast army, said to number 2,000,000, began to march toward the Hellespont; according to Herodotus it took this force seven days and nights to march across the bridge. Grote, who discredits the immense numbers given by Herodotus, nevertheless says: "We may well believe that the numbers of Xerxes were greater than were ever assembled in ancient times or perhaps at any known epoch of history." This immense force moved on without resistance till brought to a stand by Leonidas at Thermopylæ; and, although the Greeks were defeated and slain, it was not without severe fighting and heavy loss on the part of the Persians. When Xerxes arrived at Athens, three months after crossing the Hellespont, he found the city deserted. Meantime the Persian and Greek fleets had taken their positions in the narrow strait between Salamis and the Attic coast, where the great naval battle of Salamis took place, in which the Persians were signally defeated, Xerxes himself fleeing in haste to the Hellespont. The bridge of boats having been destroyed in a storm, he crossed in a vessel, leaving Mardonius with 300,000 men to carry on operations in Greece. Next year that general was defeated by the Greeks in the famous battle of Platæa; and in 478 B. C. the Persians lost their last possession in Europe by the capture of Sestos in the Hellespont. Little more is known of the history of Xerxes, except that he was murdered by Artabanus, who aspired to the throne, and was succeeded by Artaxerxes, his son, in 465 B. C. Herodotus commended him as a man and as a monarch. See Greece, Leonidas, Platæa, Salamis, Themistocles and Thermopylæ.

Ximenes (*zĭ-mē′nĕz*) **De Cisneros, Francisco,** in Spain commonly called Cisneros, a well-known statesman, archbishop and cardinal, was born at Torrelaguna in Castile in 1436. His great reputation for piety and learning led Queen Isabella to choose him in 1492 for her confessor and three years after to appoint him archbishop of Toledo — a dignity which he refused to accept until he had received an express command from the pope. In 1507 he was promoted to the dignity of cardinal. During the lifetime of Isabella he was the guiding spirit in Spanish affairs; and on her death in 1504 he held the balance between the parties of Ferdinand and Philip of Burgundy, husband of Joanna, heiress of the crown. When Ferdinand died in 1516, he named Ximenes regent of Spain until the arrival of Charles his grandson; and, although the grandees formed a powerful combination against him, he was able to subdue them by his prompt and efficient measures and compelled them to submit to his authority. Scholars are indebted to him for the famous Complutensian edition (1502–18) of the Bible in several languages. He died at Roa on Nov. 8, 1517.

Ximenes de Quesada (*zĭ-mē′nĕz dā kā-sä′dä*), **Gonzalo,** a Spanish explorer, was born in Granada in 1498, and came to America in 1535, when, under the orders of Governor Santa Marta, he took command of an expedition against the Chibcha Indians in New Granada. After enduring great privations and overcoming all obstacles, he conquered the cities of Tuna and Iraca, where he secured a vast quantity of treasure, which he divided among his soldiers. In 1538 Ximenes founded the city of Bogota in Colombia, and soon after sailed for Europe with Frederman from Venezuela and Benalcazar from Quito, in order to refer all matters in dispute between them to the king. Ximenes was at first fined and suspended from his offices by the king, but afterwards was sent to New Granada with the title of marshal. In 1561 he was appointed governor-in-chief, a position which he continued to hold until his death at Mariqueta, Feb. 16, 1579.

X-Ray. See Roentgen Rays.

Xylem (*zī′lĕm*), (in plants), that portion of a vascular bundle which contains the tracheary tissue and commonly is called the wood. The xylem is chiefly concerned in the ascent of sap, and in trees forms all of the trunk except the bark. See Vascular Bundle.

Y

Y (*wī*), the twenty-fifth letter, sometimes a voiced consonant, sometimes a semivowel. The consonant is a palatal, as in *beyond*, *year*. The semivowel is closely akin to long *e* and short *i*, as in *happy*. *Y* occurs as a consonant at the beginning of syllables or words, but *y* the vowel at the middle or end. The vowel is a superfluous letter. Y^e and Y^t are mistakes for *the* and *that*, *Y* resembling an Old English letter for *th*.

Yacht (*yŏt*), a small vessel so constructed as to secure elegance and speed, and exclusively employed for racing and pleasure-sailing. The first authentic record of a sailing club is in 1720, when the Cork Harbor Water Club, now known as the Royal Cork Yacht Club, was established in Ireland. But the boats were small. From this time to the end of the 18th century yachting developed very slowly. Yacht-racing as a pastime scarcely had a beginning at the opening of the 19th century. During that century, however, the progress was such that there are numerous yacht clubs in Europe and the United States, and improvements almost without number have been devised for increasing the speed and efficiency of vessels constructed for yachting purposes. As to the number of yachts now afloat, cruisers as well as racers, the British yacht-fleet, which in 1850 consisted of 500 sailing vessels and three steamers, now numbers over 4,000 yachts Next to Great Britain the United States possess the largest number afloat, amounting to about 1,500. If to the foregoing are added the yachts of other countries, a grand total of 6,000 or 7,000 is reached. While the construction of sailing-vessels has wonderfully progressed since 1850, the building of steam-yachts has gone on still more rapidly. The building of yachts has changed greatly from the simple, unpretending brig, with small tonnage, clumsy build and baggy sails of the early yachts of the Royal Cork Club, to the immense flat sails, larger size and long, narrow shape of the yacht of the present. The effect of these changes was a great increase of speed. Racing yachts are schooners, cutters or yawls. The schooners nearly are always fore-and-aft rigged, *i. e.*, not carrying square topsail yards on the foremast. The cutter differs from the American sloop in carrying a sail, termed the foresail, on a stay from the masthead to the stem, the jib and flying jib being set on a long running-bowsprit. The cutter, in fact, substitutes two head-sails for one used in the sloop. The yawl differs from the cutter in carrying a slightly reduced mast and boom, the latter leaving room for a small aftermast, stepped close astern, on which is set a lugsail sheeted home to the end of a running-boom. In racing the competitors use a large racing-sail, called a spanker, set on a long beam projecting from the foot of the mast at right angles to the vessel. The sail, which is flat and triangular, extends from the topmast head to the deck, on the opposite side to that occupied by the main-boom, though occasionally shifted to the bowsprit end. In 1851 the schooner *America* crossed the Atlantic and won the queen's cup from the *Aurora*. In the half-century following England made 11 vain efforts to win it back one of the most exciting races being the contest between the English *Genesta* and the American *Puritan* in 1885. Great interest was roused by the race between the Irish challenger *Shamrock II* and the American defender *Columbia*, winner in 1901 of the cup, which America won and held in 12 successive races. In 1903 the American *Reliance* won over *Shamrock III*. Owing to disagreements as to size and to the European war, no contest for the trophy has since been held.

Yak, an ox-like animal found in Tibet and central Asia. It is related both to the bison and the true oxen. In a wild state it is found on the high plateaus of Tibet between the Altai and Himalaya Mountains. It can at once be distinguished by the long hair, which hangs from each side like a curtain, in some cases touching the ground. The hair is longer in the domesticated than in the wild forms. The tail also is very hairy, and the white tips are cut off by the Chinese, who dye them red and use them as tassels. There is a hump over the forelegs, and this is exaggerated by the hairy mane. The yak has been domesticated for centuries in Tibet, and is extensively used as a beast of burden. It feeds on grass, and one peculiarity of its feeding is that it refuses to eat corn. These animals are about the height of a small ox. The cows yield milk, and the skins both of cows and bulls are used for clothing.

Yakutsk (*yȧ-kōōtsk'*), the chief town of the government of that name in eastern Siberia. It is situated on the left bank of Lena

River, 5,000 miles from Petrograd. The whole industry of the town consists of candle-works; but it is the principal market of eastern Siberia for traffic with the native tribes of Yakuts and Buriats. Population 6,534.

Yale, District of, west of the Kootenays, is rich in minerals and timber and possesses the largest area of agricultural land in southern British Columbia. It includes the rich valleys of Okanagan, Nicola, Similkameen and Kettle Rivers and North and South Thompson and the Boundary, and has been named The Garden of British Columbia. The main line of the Canadian Pacific passes nearly through the center of Yale from east to west, while its Okanagan branch and steamers on the lake give access to the southern portions. New branch-lines are projected and some are in course of construction, which will open a large mining and agricultural area. Cattle-raising on a large scale has been one of the chief industries, but many of the ranges are divided into small parcels which are eagerly bought by fruit-growers and small farmers. This district is rich in minerals and coal, but development has been delayed by lack of facilities for transportation.

Yale, Eli'hu, after whom Yale College (now Yale University) was named, was born at New Haven, Conn., April 5, 1648. When he was ten, his parents returned to England, and he never returned to America. In 1678 he went to the East Indies, where he remained several years and accumulated a large fortune. On his return to England he became governor of the East India Company and a fellow of the Royal Society. His gifts to the new institution in books and money amounted to about $4,000, in consequence of which it was named Yale College. He died at London, July 8, 1721.

Yale U'niver'sity, at New Haven, Conn., is one of the oldest and most famous of educational institutions in the United States. It was founded in 1701 as the Collegiate School of Connecticut, and was at Saybrook until 1716, when it was removed to New Haven. In 1718 the name was changed to Yale College, in recognition of large gifts from Elihu Yale of London. This name was changed by statute to Yale University in 1887. Besides the academical department, still designated as Yale College, it has Sheffield Scientific School, a graduate school, a school of religion, of medicine, the school of law, of forestry and a school of art and of music. The endowment is about $16,000,000. The Yale University libraries contain about 1,000,000 volumes. The faculty numbers 460, with an attendance of 3,310 students.

Yam, the tuberous root of a species of *Dioscorea*, a genus of climbing vines chiefly displayed in the tropics, where they are extensively cultivated for food. The name has also but wrongly been applied to forms of the sweet potato.

Yan'cey, William Lowndes, a highly distinguished southern orator, was born at Ogeechee Falls, Ga., Aug. 10, 1815. After receiving a collegiate education he was admitted to the bar in Abbeville, S. C., but in 1836 moved to Alabama, where he successively edited *The Catawba Democrat* and *The Wetumka Argus*. He was a member of Congress in 1844-47, and in all the events leading to the secession of the southern states was one of the most prominent and perhaps the most eloquent leader of the proslavery party — the extent of his influence in "firing the southern heart" and inducing the effort to secede being hard to overestimate. When war broke out, he was sent (1861) to Europe as the agent of the Confederate government, but failed to secure recognition by any of the European powers. On his return home he became a member of the Confederate congress, and died near Montgomery, Ala., July 28, 1863.

Yang-tse-Kiang (*yăng'tsĕ-kĭ-ăng'*), the principal river of Asia, the "girdle of China," connecting all its central provinces between Tibet and Koko-Nor and the Pacific. Its entire length through all its numerous windings under various names cannot be less than 3,000 miles. To name the cities on the banks and tributaries of this rival of the Mississippi would be to enumerate a large portion of the cities of the empire. It is navigable by the largest vessels for 900 miles from its mouth and by smaller ones for a much greater distance.

Yan'kee, the popular name for a New Englander in America, and in Europe often applied indiscriminately to the entire population of the United States, perhaps originated as a corruption of the word *English* or of French *Anglais*, as pronounced by the Indians — *Yenghies*, *Yanghies*, *Yankees*. It seems to have been first applied by British soldiers to the New Englanders as a term of reproach during the Revolutionary war. During the Civil War it was applied by the southern people to all the inhabitants of the northern states.

Yankee Doo'dle. This popular air was originally *Nankee Doodle*, and is as old as the time of Cromwell. It was known in New England before the Revolution, and is said to have been played by the English troops in derisive allusion to the then popular name of the New Englanders; and afterward the New Englanders adopted the air.

Yank'ton, So. Dak., county-seat of Yankton County, is beautifully located on the northern bank of Missouri River, near the mouth of the James. It formerly was the capital of Dakota Territory. Three lines of railway enter or pass through the city.

which is also connected by steamer with various points on the Missouri. The state hospital for the insane and Yankton College (Congregational) are located here, as are also flouring-mills and large works for the manufacture of fine hydraulic cement. Artesian wells supply the city with pure water. Population 3,787.

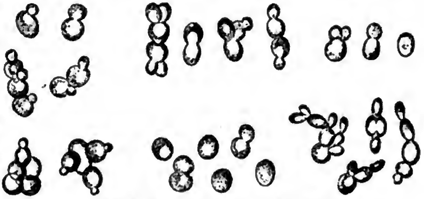
Yard, The Impe'rial, is the British standard of length, being the distance between two parallel lines on gold studs (or plugs) driven into a bar of bronze, deposited at the Standard's Office in London and used at a temperature of 62° F.

Yates, Edmund Hodgson, English novelist and dramatic critic, was born at Edinburgh, July 3, 1831, and, after serving for a number of years in one of the departments of the London postoffice, retired in 1872. He successively edited *Our Miscellany*, *Temple Bar* and *The World*, besides writing novels and dramas. His best-known novels are *Broken to Harness*, *Black Sheep* and *Kissing the Rod*. He died at London, May 20, 1894.

Yates, Richard, was born at Warsaw, Ky., Jan. 18, 1818, and after graduating at Illinois College studied law and was admitted to the bar. He served a number of terms in the Illinois legislature, and during the Civil War was governor, a position in which he won an enviable reputation for zeal and patriotism as well as for vigor and efficiency in organizing and equipping troops. So great was his popularity with the people, among whom he was familiarly known as "Dick" Yates, that, as soon as his term as governor expired, he was chosen to a seat in the United States senate, which he filled till March 4, 1871. He died at St. Louis, Nov. 27, 1873.

Yazoo', a river of Mississippi formed by the union of the Tallahatchie and the Yallobusha, runs southwestward in a very serpentine course in a deep, narrow, sluggish channel — its length being about 300 miles — and empties into the Mississippi, ten or 12 miles above Vicksburg. In the winter of 1863-64 General William T. Sherman sailed up the Yazoo with a considerable military force for the purpose of capturing the fortified position of Haines' Bluff from the Confederates, preparatory to an attack on Vicksburg. The expedition was unsuccessful.

Yeast, the common name of species of *Saccharomyces*, a genus of low plants (fungi) probably belonging to the *Ascomycetes*. The yeast-plant is a single, simple cell, which produces new cells by a peculiar budding-process. Usually the cells thus produced cling together in short chains. The most generally known of the 25 described species is *S. cerevisiæ*, the yeast used by brewers and bakers. The use of yeast is due to its great activity in the process of fermentation. When placed in sugar-containing solutions and exposed to a proper temperature, the cells multiply with great rapidity, and in their living cause the sugary solution to "sour." In this "souring" process the gas — carbon dioxide — is given off, and if it is held by some tenacious substance, as dough, it will puff it up, that is, make it "light." The process of adding yeast to dough is simply sowing yeast-plants that they may grow. See Ascomycetes.



YEAST REPRODUCING BY BUDDING

Yed'do. See Tokio.

Yel'low Bird, the name in general use for two different birds of the United States. One of them is the goldfinch, which is one of our most attractive birds. It is about five inches long, and in the summer has a yellow body, with black on the crown and black and white on the wings and tail. It also is a winter resident, but the winter dress is different, being grayish-brown, with a yellowish crown and soiled white below and a yellowish throat. The name is also given to the yellow warbler, which is also locally called the wild canary. See Goldfinch and Warbler.

Yellow Fever (Yellow Jack), an acute specific disease occurring within certain geographical limits; mostly in the West Indies, whence it is carried to climates where the temperature is above 72° F. It is characterized by a fever of short duration, a yellow tint of the skin, gastrointestinal disturbances and hemorrhages into the skin and mucous membranes. The precise nature of its virus is unknown. A severe visitation occurred in the lower Mississippi Valley in 1874, with 5,000 deaths in New Orleans and Memphis. Until the American occupation of Cuba yellow fever was practically never absent from that island. Experiments carried on in Cuba by the medical department of the United States army proved that the disease is communicated from one individual to another only by a single species of mosquito (*Stegomyia Fasciata*). Sanitary scientists predict confidently that the world will soon be rid of this scourge through improvement of hygienic conditions and the avoidance of the mosquito.

Yellow Race, The, often called the Mongolian race, includes that part of mankind which is regarded as most characteristically Asiatic. More specifically, the yellow race includes Chinese, Japanese, Tartars, Cochin-Chinese, Burmese, Tibetans, Samoyeds, Tamuls, Turks, Finns and Hungarians or Magyars. (See articles under titles above.) Some authorities believe that the Malayans and many Polynesians are distinctly Mongolian. The theory that the American Indian is descended from the Mongolian race is not generally accepted. The Celts, too, have certain traits in common with the Mongolians; but there is no proof of an actual racial connection. The characteristics of the yellow race are straight hair, coarse in texture and black in color, more abundant on the head than the face, least abundant on the body, a somewhat square head, small black eyes, narrow eyelids, which turn obliquely upwards at the outer end, small, flattish nose, high and prominent cheek-bones, rather prominent chin and yellowish skin. The yellow race probably is not inferior to the white race in intellect and fortitude; though anthropologists incline to the opinion that physically it is nearest of all races to the child and that it may represent the most primitive extant type of man.

Yellow Sea, an important inlet of the Pacific Ocean, washes the northeastern coast of China and is bounded on the west by the Chinese provinces of Shangtung and Keang-su and on the east by the peninsula of Korea and by Japan. It is more than 600 miles in length and about 400 in average breadth. Its waters are shallow and are gradually becoming still shallower, owing to the deposits of earth borne down into it by Hoang-ho and Yang-tse-Kiang Rivers.

Yellow Springs, O., a village of Greene County, 75 miles from Cincinnati, on the Springfield branch of the Panhandle railroad. It is situated in a fine agricultural region and is chiefly noted as being the seat of Antioch College, a Unitarian institution, of which the distinguished Horace Mann was the first president. Population 1,360.

Yel'lowstone, a river of the United States, rises in a beautiful lake of the same name high up in the Rocky Mountains. Receiving numerous branches from the south, it flows northeasterly through Montana and empties into Missouri River, in North Dakota, in 48° N. and 104° W. It is 800 yards wide at its mouth; 1,000 miles long; and navigable for 700 or 800 miles. The Grand Cañon of the Yellowstone is 3,000 feet deep, and to one looking up from the bottom stars are visible in broad daylight. The grandeur of the cañon is at once heightened and diversified by the upper and lower falls, the latter being one unbroken and symmetrical expanse 350 feet in height. The beautiful lake from which the river issues is about 300 square miles in area, and is between 7,000 and 8,000 feet above the sea.

Yellowstone National Park, a tract 62 miles in length and 51 in breadth, situated mainly in the northwest of Wyoming, which has been withdrawn from settlement by action of the United States government and set apart as a public park. The area of the national reservation is 3,412 square miles, exclusive of the area on the south and east of the park proper, set aside by Congress as a forest-reserve (*q. v.*). Yellowstone Park was created by an act approved in March, 1872, and is under the supervision of the secretary of the interior. Leases were in 1889 granted by the national government to Yellowstone Park Association to erect at certain suitable points hotel accommodation for visitors to the park and to maintain a naphtha launch on Yellowstone Lake, conformable to certain restrictions. The government has also provided that care shall be taken of the remnant of North American fauna and of the ruminants of the western plains and mountains, with such fish as may live in the waterways of the park outside of the geyser region. The park abounds in scenery of unparalleled grandeur. It is a region of hot springs and geysers, mountains and cañons, lakes and waterfalls. Its surface mainly is an undulating plateau, with a mean elevation of 8,000 feet above the sea, upon the surface of which flow the minor streams, while the larger ones have cut cañons for themselves, several of them of great depth. The eastern portion, however, is occupied by a mountain chain known as Absaroka Range, peaks of which rise to heights exceeding 11,000 feet. These mountains, which separate the waters of the Yellowstone from those of the Big Horn, are unsurpassed by any in the United States for grandeur and sublimity of scenery. Another group of mountains, in the shape of a horseshoe known as Washburne Mountains, occurs in the middle of the park, the highest peak of which has an elevation of 10,000 feet. The Red Mountains are in the southern part, Mt. Sheridan, their culminating peak being likewise about 10,000 feet in height. The park has an abundant rainfall and its streams are numerous and bold. Within its area are the sources of the Yellowstone and the Madison, which go to make up the Missouri, and of the Snake, one of the tributaries of the Columbia. It also contains many beautiful lakes and ponds. A convenient way of reaching the park from the east is by the Burlington route from

Chicago *via* St. Paul (Minn.) and Bismarck (N. Dak.) to Livingston (Mont.), thence southwest to Cinnabar, and thence by stage through the park. From St. Louis, Kansas City and from Burlington (Ia.) the Burlington route, *via* Omaha, is also available, the entrance being also by way of Livingston (Mont.) and Cinnabar, on the northwestern boundary of Wyoming. From Cinnabar a daily stage sets out for Mammoth Hot Springs, by way of Gardiner, a distance of six miles, where good accommodation for sight-seers is to be had, as well as at convenient points in the five days' staging throughout the park, under a franchise from the United States government. From Mammoth Hot Springs the stage-route embraces the Norris Geyser basin, the Lower Geyser, the Upper Geyser and the Lake Geyser at the western arm of Yellowstone Lake (over which a steamboat now plies), thence on the return route by way of the Grand Cañon and the Falls of the Yellowstone. The roads throughout are good, being maintained by the government.

Yen, the unit of value and account in Japan, its value being 48.5 cents in American money. Japan mints the following coins in gold (besides the silver *yen*): 1, 2, 5, 10 and 20 *yen* pieces — the value of the 10-*yen* piece being $4.85; and of the 20-*yen* piece $9.70 the rough equivalent of our $5 and $10 gold coins.

Yenisei (*yĕn'ē-sä'ē*), one of the largest rivers of Siberia, formed by the junction of the Onlon-Keme and the Bey-Keme, which rise in the mountains on the southern border of the country. It flows northward through the center of Siberia into the Arctic Ocean, forming at its mouth a long estuary. In the earlier part of its course it is interrupted by falls and rapids, but afterwards flows through a great plain or *steppe*, receiving many tributaries, its total length being over 3,000 miles

Yew, the common name of species of *Taxus*, a genus of conifers, distributed throughout the northern temperate regions. The most noticeable peculiarity of the genus is the development of a fleshy (usually scarlet) cup ("aril") about the naked seed, making the fruit look like an open berry. The common yew of Europe (*T. baccata*), very often cultivated, especially in cemeteries, is a tree of somber aspect. Veneration and superstition have long clung about it. It lives to a great age in the Old World. The American (*T. Canadensis*) is a more or less prostrate form, which is especially abundant northward; a stunted shrub with very tough wood.

Yez'o or **Yes'so,** the most northerly of the four principal islands which compose the empire of Japan. It is known also as Hokkaido. This island is mountainous and has volcanoes; it is rich in fine timber and valuable minerals, especially coal; and the rivers and coasts abound in fish. Area of Yesso or Yezo 36,299 square miles. Population 1,137,455.

Yokohama (*yō'kō-hä'mä*), a town of Japan on the island of Nippon. In 1854 it was a small fishing-village, but after it supplanted Kanagawa as the treaty-port of Yeddo in 1859 it rapidly increased. Since the recent changes in the policy of the Japanese government great improvements have been made; and broad and cleanly streets have taken the place of the former narrow and dirty thoroughfares. Population 394,303.

Yonge, Charlotte Mary, English novelist, was born at Otterbourne, Hampshire, on Aug. 11, 1823. The novel by which she is best known, although she has published several others, is *The Heir of Redclyffe*. She is said to have devoted large sums accumulated from the sale of her writings to the aid of religious missions in New Zealand. She died on March 24, 1901.

Yon'kers, N. Y., a city of Westchester County, on the Hudson River, immediately north of New York City. It was incorporated as a village in 1855; and in 1872 the town was divided, the northern portion becoming the city of Yonkers and the southern portion becoming Kingsbridge, and in 1874 a part of the city of New York. Yonkers is built on terraces rising from the Hudson 426 feet above tidewater and commanding a view of the Hudson and its Palisades. The buildings of note are the government building, three hospitals, Leake and Watts Orphan Home, the Hebrew Home for the Aged and Infirm and St. Joseph's Training School for Nurses. Yonkers has 30 churches, an admirable system of public and parochial schools, a public high school and, near the city-limits, St. Joseph's Seminary and Mount Saint Vincent Academy. The city also possesses a Carnegie Library, Woman's Institute Library and Hollywood Inn for Workingmen, with its library of 6,000 volumes. Population 79,803.

York, a city of England, situated at the junction of Ouse and Foss Rivers, nearly equidistant from London and Edinburgh. York is the most ancient of British cities. Before the Roman invasion it was *Caer Ebroc*, one of the chief towns of the Brigantes, the most numerous and powerful of the British tribes; and during the Roman dominion it was *Eboracum*, a city of the first importance. Here Hadrian lived and Severus died. Here, too, died Constantine Chlorus. Many mistakenly suppose that Constantine the Great was born here. When the Roman emperors visited Britain, *Eboracum* was their chosen residence, as it was the residence of the imperial legates when the emperors were absent. Alcuin, tutor of Charlemagne's children; Etty the painter; and Flaxman the sculptor were natives of York. The first English parliament was held at York in 1160 by Henry II and in the immediate neighborhood of the city Fairfax conquered Prince Rupert on Marston Moor during the Civil War. The city and castle, already besieged, surrendered to the parliamentary forces a few weeks after. The educational institutions are both numerous and useful. Notable among them are St. Peter's School, founded in 1557; Archbishop Holgate's free school, dating from Henry VIII; the Blue Coat School for boys and the Gray Coat School for girls; and Yorkshire School for the Blind, conducted in a palace originally built for the lord president of the council of the north. The cathedral of York Minster is one of the glories of architecture. Population 84,730.

York, Pa., county-seat of York County, on Codorus Creek, 100 miles west of Philadelphia and 52 from Baltimore. The Northern Central, Pennsylvania and Western Maryland afford railroad facilities. It manufactures safes, silk, ice-machines, paper, chains, carriages, agricultural implements, wire-cloth, turbine-wheels and other articles. York is noted for its diversified and extensive industries. In addition to public schools it contains an academy for boys, a coëducational institute and three parochial schools. The Continental Congress sat here during the British occupancy of Philadelphia (1777–8) in the Revolutionary War. Population 44,750.

GEORGE V. WHEN DUKE OF CORNWALL AND YORK

York, H. R. H., George, Duke of, second son of King Edward VII, and later King George V, of Great Britain and Ireland, was born at Marlborough House, London, on June 3, 1865. With his older brother, the late Duke of Clarence, he entered the navy as a cadet in June, 1877, and spent a number of years in the service, his latest command being on H. M. S. *Crescent*. His royal majesty has been in most parts of the world and done duty in various stations of the British fleet. In 1892 he became heir to the throne and in 1901 was created Prince of Wales. In 1893 he married Princess Victoria Mary of Teck. By her he has six children, the oldest of whom Edward, was born in 1894. In 1901, accompanied by the duchess, the duke paid a visit of state to Australia, New Zealand and Canada, the visit to Australia being designed to commemorate the opening of the first parliament of the new Australian Federation or Commonwealth. In 1908 he visited Quebec at the celebration of its fourth centenary. See GEORGE V. AND WALES, PRINCE OF.

York, a river of Virginia formed by the Pamunkey and Mattapony, flowing southeastward to Chesapeake Bay, nearly opposite Cape Charles. It is 40 miles long and from one to three wide.

York, House of, was founded by Edmund Langley, fifth son of Edward III, being made Duke of York in 1385. Richard, the third duke, claimed the throne of England in opposition to Henry VI, but never succeeded to it himself. After seeking for many years to correct the weaknesses of Henry's government, Richard first took arms against the ill-advisers who were his personal enemies, and at length claimed the crown in Parliament as his right. A compromise was proposed that Henry should retain his crown during his life, and the duke and his heirs succeed after Henry's death. This was accepted both by Henry and by Richard, but the act was repudiated by Queen Margaret and her followers, and the duke was slain at the battle of Wakefield soon after. In little more than two months, however, Richard's son was proclaimed king in London as Edward IV, and the bloody victory of Towton soon after drove his enemies into exile and prepared the way for his coronation. Edward reigned from 1461 to 1483, when Edward V, his oldest son, after a nominal reign of two months and a half, was put aside and murdered by Richard III, his uncle. Richard then became king; but in a little more than two years was defeated and slain at Bosworth (Aug. 22, 1485) by Henry Tudor, Earl of Richmond, who was crowned as Henry VII. His marriage with the daughter of Edward IV (1486) united the houses of York and Lancaster. See ROSES, WARS OF.

York'town, Va., county-seat of York County, is on York River, ten miles from its mouth and about 60 miles from Richmond. Yorktown is noted for the surrender of Lord Cornwallis (*q. v.*) and his army to Washington in 1781, which was the virtual close of the Revolutionary War, and for the unsuccessful siege by General McClellan in the spring of 1862. Yorktown contains the oldest custom-house in the country, and is one of the oldest towns in the United States. Population 150.

Yosemite (*yō-sĕm'ĭ-tē*), a valley in Mariposa County, Cal., on the western side of the Sierra Nevada, about 150 miles from San Francisco, unequaled for grandeur and magnificence of scenery. It is seven or eight miles long and about a mile wide, and is about a mile below the level of the surrounding region. Of its various waterfalls the Bridal Veil is particularly noted for beauty and also for its height, which is nearly 1,000 feet. This valley, which was first entered by white men in 1855, attracts visitors every year from all parts of the world. Perhaps nowhere else on earth is there so remarkable a combination of beauty and sublimity.

Youmans (*yo͞o′manz*), **Edward L.**, a distinguished American scientist, was born at Coeymans, N. Y., June 3, 1821; and, although suffering for some years from almost total blindness, he pursued his studies in physics and chemistry with marked zeal and proficiency, his sister conducting experiments for him. Among the works for which he is distinguished are *Class-Book of Chemistry, Correlation and Conservatism of Forces, Alcohol and the Constitution of Man, Handbook of Household Science, The Culture Demanded by Modern Life.* He died at New York, Jan. 18, 1887.

Yoshihito (*yō shē hē tō*), **Emperor of Japan,** came to the throne on the death of his father Mutsuhito (*q. v.*) July 30, 1912.

Young, Brigham, the noted head of the Mormon church, was born at Whittingham, Vt., June 1, 1801. In 1832, having become a convert to Mormonism, he was made an elder of the church, and began to preach at the Mormon settlement at Kirkland, O. Three years later he was sent as a missionary to New England, where he made quite a number of converts. After the death of Joseph Smith at Nauvoo, Ill., in 1844, Young was chosen president in his place. In 1847 he led his followers to Utah (*q. v.*) and founded Salt Lake City. Here, under his able leadership, the community prospered, other settlements were established, and the foundations of the present state were laid. He died on August 29, 1877, leaving a fortune estimated at $2,000,000. See MORMONS.

Young, Charles Augustus, a distinguished American astronomer, was born at Hanover N. H., Dec. 15, 1834. He was educated at Dartmouth College, where he graduated in 1853. After teaching classics for three years at Phillips Andover Academy, he went to Western Reserve College in Ohio, where he taught astronomy, natural philosophy and mathematics. For three months during the Civil War he served in the 85th Ohio Volunteers At the close of the war he was appointed to the chair of physics and astronomy at Dartmouth, a position which his father had held some years earlier. During the following 12 years Professor Young made a brilliant series of discoveries in solar physics, among which may be mentioned the "reversing layer" of the solar atmosphere, observed at the Spanish eclipse of 1870, the rotation period of the sun measured on Döppler's principle, the bright line spectrum of the chromosphere (1872) and the motion and forms of solar prominences. In 1877 he was called to the chair of astronomy at Princeton University. He was the highest living authority on the sun, and in 1906 was awarded a Carnegie old-age pension for his brilliant services to science. It is needless to say that he received many honors, as election to the National Academy of Sciences, degrees and honorary memberships. His published works include *The Sun, General Astronomy, Lessons in Astronomy* etc. He died January 4, 1908.

Young, Edward, English poet, was born on July 3, 1683, at Upham, Hampshire, where his father was rector. He was educated at Winchester School and afterwards at Oxford. He published several poems and tragedies, but the work by which alone he is remembered is *Night Thoughts*, which has passed through a great many editions, and is more or less familiar to the general reader. A number of his sententious lines have passed into common use and in a manner become proverbial. He died on April 12, 1765.

Young, Mrs. Ella Flagg, formerly city superintendent of Chicago schools and one of the most distinguished of living educators, was born in Buffalo (1845). Mrs. Young, then Miss Flagg, graduated from the Chicago High and Chicago Normal Schools, received her Ph. D. from Chicago University and LL. D. from the University of Illinois. In 1868 she married William Young. She became successively assistant superintendent of district schools, professor of education in the University of Chicago, principal of the Chicago Normal School and finally city superintendent. She was elected president of the National Educational Association (1910-11). Mrs. Young was a member of the Political Equality League and the Illinois Equal Suffrage Association. Her works on education are among the most profound as well as practical contributions to the science. They include: *Isolation in the School* and *Ethics in the School.* Mrs. Young died in Washington in 1918.

Young, Thomas, an eminent man of science, was born at Milverton, England, in 1773. In 1801 he was appointed professor of natural philosophy in the Royal Institution. It was during his two years' occupancy of this chair that he published *Outlines and Experiments Respecting Sound and Light*, his most important memoir. In it he shows that two rays of light may be added together to produce darkness—the phenomenon of *interference.* Sir John Herschel asserted that, even if Young had made no other discovery, this alone would have made him immortal as a scientist. He died at London on May 10, 1829. Dr. Peacock has published an interesting *Life of Young*, and has edited his *Miscellaneous Works.* But all of Young's more important contributions are reprinted in his *Lectures on Natural Philosophy*, which exerted a powerful influence on physical science during half a century.

Young Men's Chris′tian Asso′ciation. This is an organization having a branch in most of the leading cities (and in some smaller towns) in the United States Great Britain and scores of other countries, whose special object is to promote the welfare of young men. The condition of active membership in this organization is membership in some Evangelical church; but young men not members of churches are admitted as associate-members and are entitled to all the privileges of the association, except a voice in the election of its officers. In addition to various religious services the Association generally provides a library and reading-room (open to the public), a gymnasium, bathroom, lectures, special instruction and proper amusements; and its power for good has been demonstrated so clearly as to command universal recognition. The first association organized in the United States was at Boston in the winter of 1851-2, but on account of the Civil War the growth of the institution hardly began until 1866. There are now in North America 2,600 association in cities and towns, 791 in universities and colleges, 233 among railroad men, and others in the army and navy, and among the Indians and Negroes, totaling 626,000 members. In 12,611 associations special work was carried on for boys. The associations own and occupy on this continent 788 buildings valued at $74,379,533. The activities of the Y. M. C. A., already manifold, are increasing every year. Games, gymnastics, reading and study courses, both cultural and practical, as well as manifold opportunities for social service work, are offered. See Williams, Sir Geo. W. and European War.

Young's Mod'ulus. See Elasticity.

Young'stown, O., county-seat of Mahoning County, on the Mahoning River, 67 miles from Cleveland and 64 from Pittsburg. Being in a coal and iron region, it has become a very important manufacturing center, having rolling-mills, blast-furnaces, steel-plants and allied industries, producing boilers, bridges, cars, cranes, engines, forgings, machinery and steel-castings. It also manufactures automobiles, brass-castings, flour, leather and powder, and has oilcloth and rubber-plants. The buildings of most note are Dollar Savings and Trust Company, the Y. M. C. A. building, the City Hospital and Memorial Kindergarten. The city has excellent public and parochial schools, a high school (Rayen School) and several private schools. Here are McMillan Library and Rayen School Library. There are many churches representing several denominations. Population 79,066.

Young Women's Christian Association is an organization which seeks to help young women by providing for their physical, social, mental and spiritual wants. The means used are Bible training-classes, evangelical meetings, personal religious work, libraries and reading-rooms, classes in various studies, musical and literary entertainments, socials and receptions in homelike rooms, helpful companionships and holiday excursions. There is a special department for young women of colleges. The Young Women's Christian Association was formed in 1894. Eighteen national associations, in Great Britain, United States, Canada, Germany, Italy, France, Australasia, Finland, Holland, Japan, Portugal, South Africa, Sweden, India, Denmark, Brazil, Hungary and China, are now affiliated with headquarters in London. The Young Women's Christian Association of the United States was organized in 1906. In 1916 there were 239 city associations and 702 student associations. Special work has been instituted for students of professional art, nursing and music for immigrant women, Negroes and Indians. Each year twelve summer conferences are held to train workers in Bible Study and Association Work. There is also a Y. W. C. A. training school in New York City for the purpose of training young women in executive work. Much good is accomplished by the association boarding-houses in large cities, by providing homes for working girls at a low rate. See European War.

Ypsilanti (*ĭp'sĭ-lăn'tĭ*), a city in Washtenaw County, Michigan, on the Michigan Central Railroad, 30 miles west of Detroit. Considerable manufacturing is carried on, and it is a prominent educational center, being the seat of Michigan Normal School, one of the leading educational institutions of the country. Population, 7,500.

Yucatan (*yōō'kȧ tăn'*), a peninsula of Mexico, bounded on the west and north by the Gulf of Mexico, on the east by the Caribbean Sea and on the south by Guatemala. It comprises the states of Yucatan and Campeche. The eastern coast is indented with numerous bays, some forming excellent harbors. The face of the country is low and level, except in the east, where a chain of hills extends from northeast to southwest. The only important river is the Usumasinta. The soil in some portions is very fertile, yielding abundant crops of maize, rice, tobacco, sugar-cane and other agricultural products. According to a law that now is enforced education is free and compulsory. The primary schools, though mainly supported by the states and cities, receive governmental grants, and there are secondary schools, seminaries and colleges for higher education. The area of the peninsula is 53,290 square miles. Population of the peninsula 422,815. Merida, the capital of Yucatan, has a population of 61,999.

Yucca (*yŭk'kȧ*) **Moth**, a small moth which gathers pollen and fertilizes the yucca-plant. A very remarkable relation has been shown to exist between this moth and the plant. The yuccas are lily-like plants, of which the Spanish bayonet is an example. The stamens are so placed that the pollen cannot get into the tube of the stigma without artificial aid. The plant is sterile without the moth, and the larvæ of the latter feeds on the seeds, so that, in fertilizing the plant, the mother moth is providing for her offspring. The female moth (*Pronuba yuccasella*) is about half an inch long and of silvery white color. She begins her operations after dark, and, in setting about to provide for the future generation, she first collects a pellet of pollen with her jaws and fore legs. She then begins to deposit eggs in the walls of the unripe fruit-pod, using her lance-like ovipositor to penetrate the outer covering. She then goes to the tube of the stigma, which leads into the fruit-pod and thrusts pollen down it, using her tongue to push the pollen toward the undeveloped seeds. The larvæ are hatched and feed upon the developing seeds, but as not all of these are consumed, the double purpose has been effected of fertilizing the plant and providing food for her young. Consult *The Yucca Moth and Yucca Pollination, Missouri Botanical Garden Report for 1892.*

Yukon (*yōō'kŏn*) **Territory, Can.,** the most important part of northern Canada at present. It extends from the northern boundary of British Columbia to the Arctic Ocean and from the Rocky Mountains to Alaska, U. S. A. It is about 650 miles from north to south by 550 in greatest breadth from east to west. Although it does not touch the Pacific, its southern boundary is only 30 miles from tidewater. A railway of 110 miles connects at Skagway, the head of tidewater in Alaska, with White Horse at the head of steamboat navigation on Yukon River. This is navigable for large steamers from White Horse through Yukon Territory and Alaska to Bering Sea, a distance of 1,630 miles. Yukon is important because of the gold discoveries on Klondike River in 1897. There had been gold-mining on a small scale on Stewart and Forty Mile Rivers, but in 1897 remarkably rich discoveries were made in two streams flowing into the Klondike, a tributary of the Yukon, and in some adjacent streams. The stampede which followed was one of the most remarkable the world has known. Since that time over $100,000,000 in gold have been taken out, and investments of many millions are now being made in the expectation of taking out one hundred million dollars more in the next few years. There are placer-mines in active operation in widely separated portions of the territory, and silver, copper, quartz and coal mines as well. Dawson, the capital, is on the Yukon at the mouth of the Klondike. Although Yukon is only a few miles south of the Arctic circle, the climate in summer is very pleasant, and hardy vegetables, as turnips and cabbages grow very well. Below the surface the ground in the northern part of the territory is always frozen, but the surface is not frozen from April to October inclusive. Population 8,000.

Yukon, a river rising in the Dominion of Canada and flowing through Alaska into the Pacific at Norton Sound, its total length being about 2,000 miles.

Yu'ma, the southwestern county of Arizona, U. S. A., lying directly north of Mexico. It is intersected by Gila River and is separated from California by the Colorado. The valleys, when irrigated, are fertile, but the rest is desert. Yuma, the county-seat, with 6,500 inhabitants, stands on the eastern bank of Colorado River. See ARIZONA.

Yumas, a tribe of American Indians, very few in number, occupying the territory on both sides of the Colorado near its junction with the Gila.

Z

Z (*zē, zĕd, ĭzzẽrd*), the twenty-sixth letter, is a voiced consonant. It is a dental, *zh* a palatal. Ordinarily it has a buzzing sound, as in *zone, dizzy, buzz*. *Z* in some words has the sound of *zh*, as in *azure*. Its own sound is more often represented by *s* than *z*.

Zacatecas (*sä'kä-tä'käs*), capital of the Mexican state of that name, lies in a deep valley or ravine, somewhat over 300 miles from the City of Mexico. It is built over a vein of silver which has been deeply explored. The streets are somewhat narrow and crooked, but it has a fine appearance from a distance, owing to the size and massiveness of its churches and the elegance of many of its residences. Population 32,856; of the state 447,265.

Zahm, John Augustus, born at Lexington, O., June 14, 1851; graduated at Notre Dame University and joined the Congregation of Holy Cross in 1871; became a priest in 1874; and was Provincial of his order in the United States from 1897 to 1906. He studied and experimented with Helmholtz in Germany, and is a leading authority on acoustics; his first book, *Sound and Music* (1893) popularized that subject and greatly aided musical science. He is known as an advanced evolutionist, but his works aim only to show the harmony between demonstrated science and the Christian religion. They are *Evolution and Dogma; Catholic Science and Catholic Scientists; Scientific Theory and Catholic Doctrine; Science and the Church*. His brother, a layman, Albert F. Zahm, Ph. D., professor of physics at the Catholic University of Washington, D. C., is a noted authority on aërodynamics, and has been of great service to aëronautical investigators.

Za'ma, The Battle of, was fought about 100 miles southwest of Carthage in B. C. 202, between the Romans under Publius Cornelius Scipio and the Carthaginians under Hannibal. The Carthaginians were completely defeated, and Hannibal became a fugitive until his death. There were two places, about 30 miles apart, called Zama. The scene of the battle according to Polybius, lay west of Carthage, at a distance of two days' journey. Some authorities locate the battle at the other Zama, perhaps five days' journey from Carthage.

Zambezi (*zăm-bā'zē*) **River and Region,** the extensive region in southeastern Africa known to medieval geographers under the general name of the empire of Monomotapa, is shown on old maps as drained by a river, called Zambese or Zambere, which plainly is the modern Zambezi. Although the lower region of the Zambezi, for at least 300 miles from its mouth, has nominally been in possession of the Portuguese since the beginning of the 16th century, it is only within the last half of the 19th century, through the reports of Livingstone and other explorers, that we gained any definite knowledge of this vast region, the total length of whose river is 1,650 miles. The river bears the name of Zambezi from its mouth to its junction with the Chobe; thence to its junction with the Liba, coming from Lake Dilolo, it is called the Liambai. Part of the upper basin of the Zambezi was explored by Major Serpa Pinto in 1878–9. In the region where the Liba joins the Liambai the main stream is 200 or 300 yards wide and quite deep. From the confluence to Victoria Falls there are many long tracts that could easily be plied by large steamers. Lake Dilolo, from which the Liba flows, seems to have an outlet both to the north and to the south, the northern outlet probably running into one of the tributaries of the Kongo. Large areas in this region are liable to be flooded and to stand under water for considerable periods at a time. Victoria Falls are about 2,500 feet above the sea, while Lake Shirwa, a smaller lake southeast of Nyasa, is 2,000 feet. The natives inhabiting the coast region drained by the Zambezi are of the pure negro type, while the Kololo who were found in the central and upper country, belong to the Betjuana family. According to Pinto this tribe long ago ceased to have separate existence. On the upper Zambezi Pinto discovered a tribe of yellowish white color. The Zulu tribe, who inhabit the high region dividing the Limpopo from the Zambezi basin, have overrun and conquered nearly all the tribes south of them. The possession is governed by the Mozambique and Nyasa Companies, and the Zambezia Company carries on industrial, commercial, agricultural and mining operations, while the Mozambique Sugar Company has plantations on the lower Zambezi. The Zambezi is navigable for stern-wheelers as far as Tete. The ports of Portuguese East Africa are visited regularly by the steamers of the German East Africa line, and on the Zambezi and Shiré Rivers many small steamers ply. The Delagoa Bay

Railway has a length of 57 miles in the colony, and is continued for 290 miles to Pretoria. Beira Railway has a length of 204 miles in the colony, and is continued from the British frontier to Bulawayo. See Central Africa Protectorate, Nyasaland, Portuguese East Africa and Rhodesia. The military force of the colony is 4,888 men, three fourths of whom are natives.

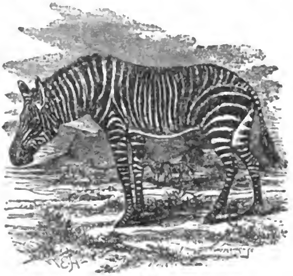
Zambezia. See Portuguese East Africa and Rhodesia.

Zanes'ville, O., county-seat of Muskingum County, on both sides of Muskingum River, at the mouth of Licking River, 55 miles east of Columbus, is in a beautiful and fertile valley, and is crowded with manufactures and other business enterprises. Having fine railroad and river facilities, it is a prosperous and busy city. It has rolling-mills, blast-furnaces, brass and iron foundries, glass and soap factories, flour, woolen and paper mills, railroad and other machine shops, tile-works and extensive potteries making fine ware. It also has several tanneries, potteries, bentwood works and brick-yards, and manufactures agricultural implements. The Y bridge spanning the Muskingum and Licking Rivers is the only structure of its kind in the United States. Among the prominent buildings are the Masonic Temple, the People's Savings Bank, Soldiers' and Sailors' Monumental Building, the two opera-houses and Zanesville High School. The city has an admirable system of public and parochial schools, a business college, an academy (R. C.), many churches and McIntire Home for Children. Zanesville was settled in 1799, and was the state capital from 1810 to 1812. Population 28,026.

Zang'will, Israel, British novelist and *littérateur*, of Jewish origin, was born in London in 1864 and educated at the Jews' Free School, Spitalfields. He has travelled much, chiefly on lecturing tours, visiting not only the chief places in Europe and in Palestine but the United States. His writings, besides his Jewish stories, as *Children of the Ghetto* and *Ghetto Tragedies* include several plays, the chief ones being *Merely Mary Ann* and *Nurse Marjorie*, both of which have appeared on the American stage. After teaching, Zangwill for a time was a journalist, founding *Ariel or The London Puck* in 1889. Then he took to writing novels and to miscellaneous literary composition. His more notable works include *The Bachelor's Club, The Big Bow Mystery; The Old Maid's Club*, a satire; *The King of the Schnorrers; The Master; Dreamers of the Ghetto; They that Walk in Darkness;* and *The Mantle of Elijah*, the latter being also dramatized. He has, moreover, published essays entitled *Without Prejudice*, some verse; humorous political effusions under the title of *The Premier and the Painter;* and gossipy criticisms entitled *Men, Women and Books*, the latter appearing in *The Cosmopolitan* of New York City. He is interested in the colonizing of Jews in British East Africa and is connected with the Zionist movement.

Zanzibar (*zăn'zĭ-bär'*) or **Zanguebar,** an Arab sultanate under British control, comprises the islands of Lamu, Mafia, Pemba and Zanzibar on the eastern coast of Africa opposite the German sphere. The sultan is titular sovereign of the coast of British East Africa for ten miles inland, but it is administered by the British. The island of Zanzibar, about 50 miles in length and from 15 to 30 in breadth, is the most important of the sultan's dominions. It contains an area of 640 square miles, and the soil in most parts is exceedingly fertile. The principal products are cocoanuts, cloves, rice, sugar-cane and fruits. Pemba produces four fifths of all the cloves in the world. The population of the island is estimated at 114,000 and that of Pemba at 83,130, among them many foreigners, for the most part engaged in trade. The town of Zanzibar has 100,000 inhabitants. The soil along the coast is fertile in rice, millet, peas, beans, melons, pumpkins, sugar-cane, cocoanuts and bananas and the forests supply many valuable species of timber. Cattle, sheep and fowls are plentiful, and wild animals abound. The heat on the coast is excessive, and the climate is unfavorable to Europeans and Americans. The protectorate has had a regular government since October, 1901, with a responsible ministry. Its revenues are derived chiefly from customs-duties and taxes on produce. The chief imports are cottons, rice, groceries and petroleum; the chief exports, cloves, cottons, copra, ivory and grain. Zanzibar is in direct communication with Great Britain by cable. Mohammedanism is the prevailing religion, and European immigration is restricted, but Zanzibar is a center for trade, missions and exploration. The Arabs of Muscat acquired the East African coast between 1698 and 1807, partly by conquest from the Portuguese, partly from the Africans, but Zanguebar became independent in 1856. Between 1886 and 1890 the Germans and British divided the continental dominions between them, Germany paying the sultan $1,000,000 for his rights.

Ze'bra, a striped animal of Africa related to the wild ass. The true or mountain zebra inhabits mountainous regions in Cape Colony. Owing to the persecution of hunters, it is scarce now and is fast being exterminated. It is about four feet high at the shoulders. Its general color is white, with black stripes on the body, limbs and tail. Those on the limbs extend to the hoofs and those on the tail to the tuft of hair. Burchell's zebra is a larger and more robust animal, with a longer mane and a fuller tail. Its general ground-color is pale yellowish brown. The stripes are dark brown or black, but do not extend so far on the limbs and on the tail as they do in the mountain zebra. The zebra has never been successfully domesticated. Experiments have proved that it can be made to work well in harness, if properly treated, but general improvement and making use of it seem impossible of attainment. The flesh is eaten by the natives, and the hide is used for leather. The quagga (*q. v.*) is not a true zebra.



ZEBRA

Ze'bu, the name sometimes used for a humped ox of India (*Bos Indicus*). This name, however, is not used in India, being an invention of foreign people. The zebu is closely related to the domesticated ox. It no longer is found in the wild state. The animal possesses a well-marked hump of fat on the shoulders, which is considered a delicacy for the table. It has long ears pointing downward and very short blunt horns. The cows are milked. These animals are used in plowing, for drawing carriages and for riding. Similar animals are found in China and in eastern Africa. The sacred bulls of the Hindus belong to this species.

Zechari'ah, one of the ancient Hebrew prophets, was born in Babylonia during the captivity, and accompanied the exiles on the return to Jerusalem under Zerubbabel and Joshua. Very little is known of his history, but there is enough to show that he was a man of great influence and combined the functions of priest and prophet. His prophecies may be divided into three parts. The first eight chapters consist mainly of a series of visions relating to the building of the temple and the glory that shall result for Jerusalem; the second portion, chapters ix-xi, threatens Damascus and Phœnicia with ruin and predicts that Judah will be greater than Javan (Greece) and that both Egypt and Assyria will be humbled; while the remaining portion sets forth that dark times are before Judah, which shall be an ordeal for the nation. after which a millennium of holiness will be ushered in. "In that day upon the bells of the horses shall be *Holiness unto the Lord;* and the pots in the Lord's house shall be like the bowls before the altar. Yea! every pot in Jerusalem and in Judah shall be holiness unto the Lord of hosts."

Zee'man Effect, an important relation between light and magnetism, discovered by Zeeman of Holland in 1897. This relation is as follows: Zeeman found that if a flame colored with ordinary table-salt — the so-called sodium flame — is placed between the poles of a strong electromagnet and examined with a powerful spectroscope, the appearance of the sodium lines is very much changed. Later investigations show that spectral lines are tripled when the source of light is in a magnetic field and also, that the components of the triplet are polarized. For details consult Michelson's article in *The Astrophysical Journal,* Vol. VII, pp. 131–8 (1898).

Zeis'berger, David, a Moravian missionary, born in Moravia, April 11, 1721, who, after emigrating to America and living in Georgia a number of years, became one of the founders of the Moravian colony at Bethlehem, Pa., in 1740. Soon after this he became a missionary to the Indians, laboring zealously at various places in the colony. In 1772 he explored the Tuscarawas valley in Ohio and laid out a town, about ten miles from the present town of Canal Dover, being joined soon after by a number of Moravian Indians from Pennsylvania. In 1781 this settlement was broken up, and Zeisberger and his Indians were compelled to move to Sandusky, but in 1798, when Congress granted to the Moravian Indians the tract on which they had formerly lived on the Tuscarawas, a portion of them returned and formed a new settlement, which they named Goshen. Here Zeisberger died on Nov. 17, 1808.

Zem'stvos, district and provincial assemblies in European Russia, established by Emperor Alexander on Jan. 1, 1864. Under certain restrictions they administer the economic affairs of districts and provinces, under *Upranas*. They are composed of representatives elected by the peasantry, the householders of the towns and the landed proprietors. By the law of June 12, 1890, important modifications were introduced, increasing the powers of noble landowners in the affairs of the *zemstvos* and suppressing the right of peasants to elect deputies to the *zemstvos* (they present candidates out of whom the governor of the province names a deputy), thus reducing the number of representatives and limiting their powers. The institutions of the *zemstvos* are in force in 34 provinces (361 districts) of European Russia. The towns and cities have municipal organizations of their own, organized on nearly the same principles as the *zemstvos* by the law of June 16, 1870. Consult *The Statesman's Year-Book:* Russia. See DUMA.

Zend-Aves'ta. See LITERATURE, PERSIAN.

Zen'ith. See NADIR.

Ze'no, founder of the Stoic philosophy, was born at Citium in Cyprus, the dates of his birth and death being both uncertain. He flourished in the early part of the 3d century B. C., and was a contemporary of Epicurus. At 30 he was shipwrecked, and, having lost his property, adopted the doctrines of the Cynics, in which contempt for riches is conspicuously taught. Having made himself master of the various schools, he proceeded to open a school of his own, in which he might bring forth the results of his inquiries and develop his own peculiar system. He selected for his purpose the Painted Porch; and there until his death continued to teach those doctrines which, in spite of many objectionable features, inculcate the manly energy and simplicity, the patience and fortitude and the reverence for moral worth which made disciples of so many noble Roman characters. The Athenians honored Zeno's memory with a golden crown and a public burial, and his countrymen erected a monumental pillar in his honor. Scarcely any portion of his numerous writings has been preserved. He is supposed to have died about 264 B. C.

Zeno'bia, queen of Palymra, in 267 A. D., succeeded Odenathus, her husband, who had been acknowledged by Gallienus in the sovereignty of the Palmyrene empire; but when Aurelian became emperor he marched against her with a large army, and after defeating her in several battles besieged her in Palmyra. She attempted to escape by flight, but was captured and brought to Rome to adorn the triumph of her conqueror. After this she was presented by Aurelian with large possessions near Tivoli. There the remainder of her life was passed. She was a woman of great courage, high spirit and remarkable beauty. With purity of morals in private life she combined prudence, justice and liberality in her administration of public affairs. Consult Gibbon's *Decline of the Roman Empire* and Ware's *Zenobia.*

Zeus (*zūs*) was the greatest of the Hellenic deities. According to the most generally received mythology, he was the son of Cronos and Rhea and the brother of Poseidon and Hera, the latter being his wife. He expelled his father and the older dynasties of the Titans, assumed the sovereignty of the world, and successfully resisted the attacks of the giants and the conspiracies of the gods. After the dethronement of the Titans Zeus was allotted the empire of heaven and air, Hades of the infernal regions and Poseidon of the sea, while the earth was left under the power of the three. Crete, Dodona and Arcadia were the places where the worship of Zeus was most observed; and in process of time all the local gods worshiped under the name of Zeus were merged in one Hellenic divinity, who was afterward identified with the Jupiter of the Romans and the Ammon of Libya. Zeus was the father of gods and men, protector of kings and supporter of law and order, the avenger of broken oaths and other offenses; he watched over the state and the family and over strangers and suppliants; his hand wielded the lightnings and guided the stars; he ordained the changes of the seasons, and regulated the whole course of nature. He dispensed both weal and woe to mortals; but the ancients disagreed as to his power over the fates themselves, as has always been the case when men have "reasoned high on fixed fate, free will, foreknowledge absolute."

Zil'leh, a town in Asiatic Turkey, about 30 miles from Tokat. This was the scene of Julius Cæsar's battle with Pharnaces, concerning which he wrote the famous report: *Veni, vidi, vici* (I came, I saw, I conquered). Scarcely any remains of antiquity are to be found, a fortress of the middle ages having been constructed on the site of its beautiful temple. The town contains about 2,000 houses, the population being mostly Turkish.

Zinc or **Spelter,** as it is often called in commerce, is a hard, bluish-white metal, lustrous on its surface. When broken, it exhibits a crystalline fracture. At ordinary temperatures it is somewhat brittle, but when heated above 212° F. it becomes so ductile and malleable, that it may be drawn into wire or rolled into thin plates. Since the discovery of this quality the uses of this metal, which formerly was employed chiefly in connection with copper in the manufacture of brass, have greatly extended. It is used for roofing, spouting, baths, water-tanks and for covering ships' bottoms instead of copper. As a material for casting artistic works zinc has the desirable properties of a low melting-point and of taking a sharp impression from the mold, so that it requires little labor from the chaser. It also possesses considerable hardness. It has, therefore, become a favorite material for making casts of statues and different kinds of ornaments. Another important use of metallic zinc is in the cells of electric batteries, in many of which the dissolving of the zinc is the source of energy. Zinc-oxide, a white powder, is extensively used as a pigment Other compounds of zinc, as the chloride and the sulphate, are used in medicine.

Zinc-Etch'ing, a favorite process for reproducing pen-drawings or engravings in white and black. A photograph is taken of the drawing or engraving which is to be copied, and the negative is placed over a zinc or copper plate, which has been covered with a varnish, and is then exposed to the light. The varnished portions which are exposed to the light become insoluble, while the parts protected by the lines of the photograph remain soluble. The plate is then treated with an acid solution by which the soluble portions of the varnish are removed and the lines of the drawing or engraving are etched or eaten into the metal. Consult Hamerton's *Etcher's Handbook* Herkomer's *Etching* and Kohler's *Etching*.

Zinc-White or **Chinese White**, a hydrated oxide of zinc, used as a pigment in lieu of white lead. As a body-color it is largely used in water-color painting.

Zi'on, Mount, the name of the hill on which stood the southwestern part of Jerusalem, called the City of David or Upper City. At the present day the city-wall runs obliquely over the hill, so that only the northern half is included in the city. On the west and still more on the south it descends steeply into the Vale of Hinnom, 300 feet. Mount Zion is 2,500 feet above the sea. With the prophets and poets of the Old Testament it stands for the whole of Jerusalem (often called Daughter of Zion), particularly in reference to the temple.

Zi'onism, or the Zionist Movement takes its name from the famous hill in Jerusalem, described in the preceding article. It is simply a modern form of the effort to realize the dream of the Jewish people throughout the centuries, as expressed by their prophets, for the re-establishment of their national life in Palestine.

How doth the city sit solitary, that was full of people!
She that was great among the nations. (*Lamentations 1:1*).

Prominent Jews all over the world have given liberally of their time and money for the furtherance of the project. Interest in it has been stimulated from time to time by various causes, among which may be mentioned the support of such men as the Rothschilds, Baron Hirsch, and Lord Beaconsfield, the frequent Anti-Jewish riots in parts of Europe, and the propaganda of brilliant writers like Israel Zangwill, Emma Lazarus and Dr. Theodore Herzl. In connection with the literary aspect of Zionism, it is interesting to note that George Elliot in her novel with the Jewish hero, *Daniel Deronda*, is said to have given the nationalist idea the strongest impulse it had received in modern times. Beginning in 1897 a series of congresses has been held at Basle, Switzerland, to promote Zionism. These congresses, as part of their work, have organized a people's bank and established a fund for the purchase of land in Palestine. Since one of the chief difficulties in the realization of the idea has been the securing of satisfactory arrangements with the Turkish government, the news of the capture of Jerusalem by the British in 1917 was received with great enthusiasm by the Jewish as well as the Christian world.

An interesting phase of the numerous efforts to wrest the Holy Land from the Turk is identified with the name of Sabbatai Zevi. In 1666 he proclaimed himself the Messiah and attempted to inaugurate another crusade, with Jerusalem as its objective.

Zis'ka, John, the famous leader of the Hussites, was born at Trocsznow, Bohemia, about 1360. While a mere boy he became a page to King Wenceslaus of Bohemia, but soon after embraced the career of arms and distinguished himself in the war against the Teutonic Knights. Returning to Bohemia after the murder of John Huss, Ziska soon became prominent among those who sought to resist the decisions of the Council of Constance. After the outbreak at Prague in 1419 Ziska was unanimously chosen leader of the Hussites, and the first great religious conflict in Germany began in earnest. When Emperor Sigismund — who had allowed his safe-conduct to Huss to be violated — advanced an army of 40,000 men into Bohemia to obtain possession of the throne, his project was frustrated for a time by the Hussites, who defeated his army with a hastily levied force. The war against Sigismund was continued with the utmost vigor by Ziska, even after he became blind, until Sigismund became convinced that the conquest of Bohemia was impossible. He therefore proposed an arrangement with the Hussites, by which full religious liberty was allowed to them and Ziska was to be their governor, King Wenceslaus having died soon after the war broke out. But the war-worn chief did not live to complete the treaty. While besieging the castle of Przibislaw he was seized with the plague and died on Oct. 11, 1424. He was buried in a church at Czaslav, and his iron war-club was hung over his tomb.

Zo'diac, an imaginary zone of the heavens, within which lie the paths of the sun, moon and principal planets. It is bounded by two circles equidistant from the ecliptic — about 18° apart; is divided into 12 signs; and is marked by 12 constellations. The signs are geometrical divisions 30° in extent, counted from the vernal equinox in the direction of the sun's progress through them. The whole series accordingly shifts westward through the effect of precession by about one degree in 72 years, requiring 25,868 years for a complete circuit. At the moment of crossing the equator toward the north the sun is said to be at the first point of *Aries* (Ram); some 30 days later it enters *Taurus* (Bull); and so on through *Gemini* (Twins), *Cancer* (Crab), *Leo* (Lion), *Virgo* (Virgin), *Libra* (Balance), *Scorpio*

(Scorpion), *Sagittarius* (Archer), *Capricornus* (Goat), *Aquarius* (Water-Bearer) and *Pisces* (Fishes). The constellations bearing the same names coincided approximately in position when Hipparchus observed them at Rhodes, more than 2,000 years ago, with the positions they designate. The discrepancy now, however, amounts to the entire breadth of a sign, the sun's path in *Aries* lying among the stars in *Pisces;* in *Taurus* among those of *Aries;* in *Gemini* among those of *Taurus* etc. This gradual retrogression of the signs through the constellations of the zodiac will continue till in about 25,868 years they accomplish a complete circuit. After this period the sign and constellation of *Aries* will coincide as they did in the time of Hipparchus.

Zodi'acal Light. If an observer in the tropical regions of the earth on a clear, moonless night watches the western sky from sunset till the last trace of twilight has disappeared, he will notice that the twilight seems to linger longer near the point where the sun sank below the horizon and that gradually a nebulous band of light, broad toward the horizon and narrowing, first rapidly and then more slowly upward, begins to stand out clearly from the vanishing twilight, which spreads along a much wider arc of the horizon. This is the zodiacal light. When seen on a perfectly clear night, it will be noticed that it fades imperceptibly on both sides and toward the vertex and that its light is distinctly brighter toward the base than at higher points. Its width at its base may be said to vary from 10° to 30°, and the height of its vertex from 40° to 90°. It is most clearly seen in our latitude during the spring months after sunset and in the autumnal months before sunrise. This is due not to any change in the light itself, but to the fact that at other seasons of the year the ecliptic makes so small an angle with the horizon that light lying in or near it does not rise sufficiently high above the mists of the horizon to be seen after the twilight has vanished.

Zo'la, Émile, French novelist, was born at Paris, April 2, 1840, of a French mother and an Italian father, an eminent civil engineer. His distinguished son spent his boyhood at Aix, and was educated at *Lycée St. Louis*. Settling in Paris, he for a time was in the employ of Messrs. Hachette, the well-known publishing firm. His first venture in fiction was *Les Mystères de Marseille*, and in this and in *Thérèse Raquin* he at once displayed power in the critical analysis of human character. Soon after this he formed the naturalistic school of fiction, with Flaubert, Daudet and the Goncourts, chiefly marked by a hideous though powerful delineation of the crimes, weaknesses and loathsomeness of Parisian social life. The fruit in part of this was the series known as *The Rougon-Macquart Family*, modelled somewhat after Balzac's *La Comédie Humaine*. The more notable subsequent stories are *L'Assommoir*, *Nana*, *Pot Bouille*, *La Joie de Vivre*, *Au Bonheur des Dames*, *Germinal*, *La Terre*, *La Bête Humaine*, *La Débâcle* and *Le Docteur Pascal*. Their nastiness is somewhat sweetened by *La Rêve* (The Dream) and by a love-story entitled *Lourdes*. The latter forms one of a trilogy, which Zola called *Les Trois Villes — Lourdes*, *Rome* and *Paris* — all in the extreme realistic vein. His latest work, written in exile, occasioned by his courageous advocacy of the famous Dreyfus case, was entitled *Fécondité*. He was a knight of the French Legion of Honor, but was refused admittance to the French Academy. He died on Sept. 29, 1902.

Zone, literally a belt or girdle, a portion of the surface of a globe or sphere lying between any two circles of the same whose planes are parallel to each other, or that portion of the surface of a sphere cut off by the plane of a circle. As the earth's axis is inclined 23½° to the plane of the ecliptic or the sun's apparent path around the earth, the tropics of Cancer and Capricorn are located that distance north and south of the equator, respectively; and for the same reason the Arctic Circle and the Antarctic Circle are located 23½° from the north and south poles respectively. These circles are accordingly said to divide the earth's surface into five zones: to wit, the North Frigid, lying north of the Arctic Circle; the North Temperate, lying between the Arctic Circle and the Tropic of Cancer; the Torrid, lying on both sides of the equator, between the Tropic of Cancer on the north and the Tropic of Capricorn on the south; the South Temperate, lying between the Tropic of Capricorn and the Antarctic Circle; and the South Frigid, lying south of the Antarctic Circle. The area of a zone on any sphere is equal to the circumference of a great circle multiplied by the height of the zone.

Zoöl'ogy, the science of animal life. The scope of this subject broadened greatly in the latter half of the 19th century, and it came to include questions that might not at first sight appear to have a direct connection with zoölogy. For example, certain discoveries (those of Von Lenhossék) as to the nervous system of the earthworm opened the way to generalizations regarding the nervous system of higher animals, including that of the human body. Again, the studies of zoölogists on cells are helping to solve broad questions of development and heredity. Thus zoölogy comes into direct relation with the work of the anatomist, the physiologist and the psychologist. This relation is so close that medical schools are asking for a preparation in zoölogy as an introduction to medical studies. One impression that has gained wide currency should be corrected: *viz.*, that the chief business of the zoölogist is to know the different kinds of animals and be able to name them. That is zoölogy of the past, but it has been replaced by a better kind. Attention has been directed from the external appearances of animals, as shape, color, differences in horns, hoofs etc., to their internal structure and life processes. An attempt is being made to analyze their vital activities and to determine their position in the history of the universe. An examination of the textbooks of a generation ago will show that emphasis was unifomly placed on the classification of animals. In this period, also, the collector for museums and the hunter naturalist were dominant types of zoölogists. It is quite true that students of zoölogy should not be drawn away from the fields, forests and streams; nevertheless, that which is best and strongest in modern zoölogy is being worked out in the laboratory by experiments and observations on a few forms. These studies, especially in the last half of the 19th century, are leading to large generalizations regarding the science of life, which should become known to all people of liberal culture.

Zoölogy as a science aims to give a picture of animal life on the globe; to consider its structure; to analyze its activities; to account for it by tracing its history in general and in detail; and to consider its relation to nature at large. The history of biology includes that of zoölogy, and the article on biology should be consulted, where a number of general considerations are entered upon that need not be repeated here.

The new way of looking at the animal world did not come all at once, but has been the result of growth. Knowledge regarding animal life has advanced by a series of steps, and its progress can be divided into a number of periods. The first of these is the period extending from the earliest writings about animals to the renaissance of science in the 16th century. Zoölogical study was cultivated among ancient peoples and reached its highest development in that period in the work of Aristotle, the Hellenic philosopher-naturalist, who lived from B. C. 384 to B. C. 322. He was a man of truly scientific mind and made many original observations on the structure and development of animal life. With him classification was based upon structure, but was of secondary importance. His successors did not reach the level of the great Father of Natural History, as he has been called. Their work more and more took the line of systematic classification of animals, and lost in observations on structure and development. Pliny the Elder (A. D. 23-79) is the next prominent naturalist of antiquity. That Roman general and teacher has been unduly praised as a zoölogist, for he merely was a poor compiler, who mixed borrowed facts, fancy and fabulous stories. He replaced the natural classification of Aristotle by a highly artificial arrangement of animals, according to their place of abode on land or in water or in air. It is noteworthy that nothing of importance was added to the work of Aristotle till the awakening of observation in the 16th century.

In the intervening period the intellectual life of mankind took a retrograde movement. Observations and inquiry into nature were discontinued and, in fact, were discouraged by intellectual leaders. This led to superstition in reference to the natural universe. But an awakening came, and it was an epoch of unusual importance when men began once more to observe and experiment and so to lay the foundations of modern science. The new intellectual movement was led in the 16th century by Galileo, Descartes and Vesalius. The work of Vesalius (1514-64) in anatomy (*q. v.*) had great influence upon the development of zoölogy. Progress in anatomy helped zoölogy by giving a knowledge of structure. At first structural studies mainly were on the higher animals nearest man. Afterwards they were extended to other forms, including the invertebrates, and were made broadly comparative.

At the revival of learning the influence of Aristotle was mainly on the systematic classification of animals. His works were translated and extended by Wotton (1492-1555), Gesner (1516-65), Aldrovandi (1522-1605) and others who produced ponderous Latin treatises on natural history. These men and their successors for about two hundred years have been called the encyclopedists. The work of Gesner was of fine quality, and marks the beginning of careful observation and description of animals.

Passing over the notable work of naturalists like Malpighi (1628-94), Leeuwenhoek (1632-1723) and Swammerdam (1637-80) in the 17th century, who worked on minute anatomy and brought the microscope into use, we come to the period characterized by the work of Ray (1628-1705), Linnæus (1707-78) and Buffon (1707-88). Ray laid the foundations upon which Linnæus built. The name of the latter probably is more widely known than that of any other naturalist. He was a man of prodigious industry, filled with a zeal for collecting and naming natural objects. He greatly extended the number of known animals and plants, but did little toward deepening the knowledge of animal life. His chief service was in systematizing the groups and introducing the method of naming animals and plants still in use. *Systema Naturæ*, his great work, was first published in 1735, and reached the 12th edition in 1768. Buffon was a man of more philosophical mind than Linnæus. He also was a graceful writer and created a popular interest in natural history. He must not, however, be thought of as a mere popular writer; he opened new fields and led the way in matters of great importance. He paid much attention to the geographical distribution of animals, and for the first time treated the natural history of the various races of mankind scientifically. He reflected upon the relationship of animals, and is recognized as one of the early evolutionists. This particular line of thought was carried further by Lamarck (1744-1829) and St. Hilaire (1772-1844), the most noteworthy predecessors of Darwin.

The next phase of advance is marked by devotion to the study of structure. The first step in understanding a machine is to observe its parts, to know their relation and how they act on one another. That the animal machine is very complex will be admitted by the casual observer in respect to the higher animals, but there is a complexity about the simpler ones that is not generally appreciated. As Huxley said, when an oyster is swallowed few people realize that there passes the lips an organism more complicated in construction than a watch. The study of the structure of animals was carried on extensively and made comparative by Georges Cuvier (1769-1832) and his followers. They dissected and observed, and reduced the architecture of animals to a science. Thus arose comparative morphology which is now considered the first stage of zoölogical study. It will be readily seen that structure may be taken to refer only to the more obvious parts, visible to the unaided eye, or may be also extended to include the minute construction of animal tissues. Cuvier's work in anatomy was mainly on the organs, but Bichat, his contemporary (1771-1801), pushed the analysis a step further and carefully examined the tissues. His influence on the progress of zoölogy was much greater than is generally appreciated. For it is a fact that has been gradually forced upon naturalists that the processes of life take place deep in the finer structure of animals and plants. Bichat did not reach the units of structure in his work, and studies in microscopic structure were carried to a deeper level before they reached this goal. This work was done for animal tissues in 1840 by Schwann (1810-81), and led to the establishment of the cell-theory (*q. v.*). In its original form the cell-theory was very imperfect; it was extended by the discovery that the cell is a globule of protoplasm containing a nucleus, and was molded into the protoplasm theory mainly through the work of Max Schultze in 1860. See BIOLOGY.

There is still another aspect of structural study that was brought out by observations on the development of animals. The structure of animals is so complicated that it is difficult to comprehend. There are, especially in higher animals, many rudimentary organs and traces of structures that do not conform to the life of the animal and to its position in the animal scale. Now, all animals begin their life in a microscopic rudiment — the egg, which in reality is a cell set free from the body of the parent. This cell by division gives rise to new cells which remain connected, and form the many cells out of which the tissues are built. Thus animals start in a state of simplicity and grow to complexity. By observing the various stages through which they pass we get clues to the meaning of the rudimentary organs and to the relationships of animals, that would be completely lacking if we could not observe them in the process of becoming. Hence, embryology or the development (*q. v.*) of life becomes the key to understanding animal structures. This important branch of zoölogy was started in its modern phase by Wolff in 1759; but Von Baer (1792-1876) is designated the Father of Modern Embryology, because about 1827 he made this study a tracing of the history of the cell-layers.

The study of structure leads naturally to the question of use: What is the particular office or function of the organs, the tissues and the cells? This line of study is called physiology. It is to be understood that, while advances were being made in reference to the construction of animals, similar advances were in progress in reference to their physiology. William Harvey (1578-1657), Haller (1708-77) and Johannes Müller (1801-58) represent a succession of investigators in this line who pushed physiology forward. Müller, in particular, by his extraordinary industry and great insight both into anatomy and into physiology had great influence on the progress of zoölogy.

Zoölogy up to 1860 is the product of the concurrent growth of knowledge in regard to the structure of animals (morphology), their development (embryology) and their vital activities (physiology). Then an additional element was introduced which has illuminated the whole field. This was the doctrine of organic evolution, as set forth by Darwin in 1859. We must note in passing that this was not the beginning of the doctrine of organic evolution (*q. v.*); it was the particular form of Darwin's explanation that led to its taking firm hold for the first time upon the minds of naturalists. From that time to the present the study of zoölogy has been dominated by the idea of evolution, and animals and plants have been studied broadly, — in the light of their ancestral history. Progress is dependent still upon advance in anatomy, physiology and embryology, but the point of view from which the facts are considered has been changed.

We have now traced the rise of zoölogy in its principal phases down to the beginning of its especially modern aspect. The study of animal life is so great a field that naturally it has a number of divisions; it remains, therefore, to mention in a summary way its chief departments. That part of the subject which embraces the study of animal structure is *Morphology*. This word is generally used in a broad sense to mean something more than *Anatomy*, which is one division of morphology. The study of microscopic anatomy is *Histology*. It is not a different kind of study, and is separated from anatomy merely as a matter of convenience. The investigation of stages in animal development is *Embryology*. These divisions make up *Structural Zoölogy*. The general description and classification of animals is *Systematic Zoölogy*. The modern name for classification is *Taxonomy*. The *Geographical Distribution* of animals has been widely studied and elevated to the rank of a special department. Another set of studies concerning the lineage of all animals (*Evolution*) has led to broad considerations of the relation of living animals to their surroundings, to the universe and to man, and has given rise to *Philosophical Zoölogy*. Standing co-ordinate with the great field of morphology is *Physiology*, which, broadly speaking, concerns itself with the vital processes of all living organisms. *General Physiology* clearly is a department of zoölogy. Many experiments are being made to determine the responses and adaptations of animals to stimulations and to changes in the medium in which they live. This has opened the field of *Experimental Morphology*. Studies of the mental powers and the mental phenomena in animals lead to *Animal Psychology*, which may fairly be considered a part of zoölogy. A division called *Ætiology* is often recognized, having as its object the investigation of the causes of zoölogical phenomena, but it need not be assigned an independent rank, as the study of all phenomena has the discovery of their causes as an ultimate object.

The animal world is too extensive to attempt to give an outline view of it here, and reference must be made to textbooks for further consideration. Fuller accounts of some of the subjects touched upon in this article will be found under ANATOMY, DEVELOPMENT OF ANIMAL LIFE, EVOLUTION, CELL-DOCTRINE, PHYSIOLOGY, PROTOPLASM and SPONTANEOUS GENERATION. See, also, articles on such zoölogists as ARISTOTLE, CUVIER, DARWIN, MIVART, ROMANES, WALLACE, WEISSMANN and others.

Among the best books for the general reader and student of zoölogy are the following: Agassiz's *Methods of Study in Natural History;* Huxley's *The Crayfish, An Introduction to the Study of Zoölogy;* Hertwig's *General Principles of Zoölogy;* Lankester's *Zoölogy* in *The Encyclopædia Britannica;* Sedgwick and Wilson's *General Biology;* Parker's *Elementary Biology;* Thompson's *The Science of Life, The Study of Animal Life* and *Outlines of Zoölogy;* Verworn's *General Physiology;* Jordan and Kellogg's *Animal Life* ; Bell's *Comparative Anatomy and Physiology;* Parker and Haswell's *Textbook of Zoölogy* and *Manual of Zoölogy;* Boas' *Textbook of Zoölogy;* Brook's *Handbook of Invertebrate Zoölogy;* McMurrich's *Invertebrate Morphology;* Shipley and McBride's *Textbook of Zoölogy;* Weidersheim's *Comparative Anatomy of Vertebrates;* Lang's *Camparative Anatomy;* Romanes' *Darwin and after Darwin;* Osborn's *From the Greeks to Darwin;* Balfour's *Comparative Embryology;* Marshall's *Vertebrate Embryology;* Hertwig's *Textbook of Embryology;* Korschelt and Heider's *Invertebrate Embryology;* Wallace's *Geographical Distribution of Animals* and *Malay Archipelago;* Bates' *Naturalist on the Amazons;* Heilprin's *Geographical and Geological Distribution of Animals;* and *The Standard Natural History*, edited by Kingsley. For books on birds, butterflies, insects etc. see those topics. Among the best smaller zoölogies for secondary schools are those of Colton, Davenport, Kellogg, Needham and Packard. WILLIAM A. LOCY.

Zoöphyte (*zō'ō-fīt*), an old name for marine animals forming branching or tree-like colonies and, therefore, presenting a general resemblance to plants. The sponges, hydroids, branching corals and polyzoans were included under this very general title. The name signifies the plant-animal, and is more especially applicable to hydroids and branching corals. See HYDROZOA.

Zoöspore (*zō'ō-spōr*) (in plants), the swimming asexual spores of algæ, notably the green algæ. The name means animal-spores, referring to the fact that they move like aquatic animals. See SPORE.

Zoroas'ter is the name of the founder of what is known as the Parsi religion of ancient Persia. He seems to have been born in Bactria, but most of the legends concerning his history are utterly unreliable. Even the time when he lived is uncertain, but it may be safely asserted to have been as early as 1000 B. C.; possibly he was a contemporary of Moses. The fundamental idea of Zoroaster's creed is its dualism. At the beginning there existed two spirits: *Ormuzd*, who represented the good, and *Ahriman*, the evil. Ormuzd is light and life, law, order, truth and all that is pure and holy; while Ahriman is darkness, falsehood, corruption, evil and death. These two spirits are represented as in perpetual conflict for the mastery of the world; but the final triumph of Ormuzd, the good spirit, is promised to comfort the hearts of all the faithful. Other features of Zoroaster's system of doctrine may be briefly mentioned: (1) the principal duty of man in this life is to obey the word and commandments of God; (2) disobedience is punished with the death of the sinner; (3) those who obey the word of God will be free from all defects; (4) men should pray to God and worship, as He always hears the prayers of the good; (5) the souls of the pure and good will enjoy everlasting life, while those of the wicked will suffer everlasting punishment.

Zouaves (*zōō-ävz′*), a body of troops in the French army, which derives its name from a tribe of Moors in Algeria, who were taken into the French service after the conquest of that country in 1830. They were first united in the same battalions with French soldiers, retaining their Moorish dress; but, as it was soon found that the system of commingling the two races was not practicable, the French and the Kabyles were formed into separate companies. Gradually, however, the Kabyles were eliminated, and since 1840 Zouaves have been correctly described as French troops in a Moorish dress. They are recruited from the veterans of the ordinary infantry regiments, who are distinguished for fine physique, tried courage and hardihood. The uniform consists of a loose jacket and waistcoast of blue cloth ornamented with yellow braid; loose, madder-colored trousers; brown cloak; madder-colored fez cap with a yellow tassel, surrounded by a green turban; a light-blue sash of wool; yellow leather leggings; and white gaiters. They are armed with a carbine and a sword-bayonet.

Zu′lu (*zōō′lōō*) is the name of that portion of the Kafir race who inhabit Natal and the region northeast of it, until they gradually merge into the mere negro of the eastern coast north of the Zambezi. The Zulu is a more amiable savage than his brother of the Cape's frontier-districts. He is less warlike, more industrious and far more willing to act as farm-laborer or domestic servant. He by nature is social, light of heart and cheerful. His affections are steady and enduring, but his passions are strong and are called out in all their force in war. Whatever better nature he may possess, when his chief commands war he is converted into a demon. That the warlike qualities of the Zulus had not decayed was seen in the war that broke out in 1879 between England and Cetewayo (*q. v.*), the Zulu king.

Zu′luland is a province of Natal, between it and Portuguese East Africa. Previous to the war of 1879 there was no good map of the Zulu country, and even yet we know little of its geology or mineral productions. Asbestos of the Canadian or short-fiber variety has been discovered. The interior is healthy, fertile and arable. Rich gold-reefs have been found, excellent coal is mined, and there is a railway to Tugela River. The principal rivers are Umvolozi or St. Lucia River, which enters the sea about 80 miles northeast of the former Natal frontier, and the Mapoota and its branches, which drain the north of the region and fall into Delagoa Bay. None of these rivers is available for inland navigation, although a large lagoon near the mouth of the St. Lucia can be ascended for a few miles. The rivers which flow into Delagoa Bay are sluggish streams, with scarcely perceptible currents, and can be ascended for some distance. The principal inhabitants are of the Zulu race, but the Portuguese have a settlement on Delagoa Bay where they carry on some trade with the natives and the Boers. In December of 1897 Zululand was incorporated with Natal under the British crown. Its area is 10,461 square miles, with an estimated population of 225,000 in,cluding 1,100 whites. It has a representative in the legislative council, and sends two members to the legislative assembly. See NATAL.

Zuñi, a tribe of Indians belonging to the Pueblo group. See PUEBLOS.

Zürich (*zŭ′rĭk*), a city of Switzerland, capital of the canton of the same name, is at the point where the Limmat issues from the lake of Zürich and unites with its tributary, the Sihl. It is one of the most prosperous manufacturing and commercial towns of Switzerland. Yet the narrow streets and lofty houses of its older quarters give it the appearance of a medieval city. There are many interesting old buildings, the most remarkable being the cathedral erected in the 11th century. The town's library is an extensive one, and numerous museums of natural history and other similar institutions indicate the intelligence and cultivated tastes of the inhabitants There is a polytechnic school with 9,5 students and 455 listeners, and the University of Zürich bas 133 instructors and 1,412 students. Population 189,088.

Zürich, a lake of Switzerland, surrounded by the three cantons of Zürich, St. Gall and Schwyz. It is between 20 and 25 miles in length, about two in breadth, and about 500 feet deep. It is noted for beautiful scenery, the hills around being covered with numerous gardens, vineyards and orchards.

Zuyder Zee (*zī′dẽr zē*), a bay on the coast of Holland, separated from the North Sea or German Ocean by the four islands of Texel, Vlieland, Terschelling and Ameland. It is from 75 to 80 miles in length, its greatest breadth being 35 or 40 miles. In the time of the Romans the Zuyder Zee was a marshy lake communicating with the North Sea by a small river, but in the latter part of the 13th century two heavy inundations took place which broke down the dikes and submerged the whole territory, except the four islands named, making it an arm of the North Sea.

Zwingli (*tsving'lē*), **Ulrich,** Swiss reformer, was born at Wildhaus in the canton of St. Gall on Jan. 1, 1484. After being educated at Bern and at Basel, he became pastor in Glarus in 1506. Having begun to study Greek in 1513, he devoted himself from that time to the study of the New Testament, even going so far as to learn by heart the Epistles of Paul in the original language. In 1518 he was called to Zürich, and in 1522 the Reformation was formally established in that city. In 1524 Zwingli married, and soon after *Of the True and False Religion* was published. Luther and Zwingli agreed on most points, but there was a serious breach between them in regard to the real presence of Christ in the Lord's Supper, Luther adhering to this dogma and Zwingli denying it. A conference, arranged by Philip, landgrave of Hesse, was held between them at Marburg in 1529, but after spending three days in earnest discussion they separated without coming to any agreement on the point at issue. In 1531 open war broke out between Zürich and the Roman Catholic cantons of Lucerne, Schwyz, Uri, Unterwalden and Zug; and Zwingli by command of the Council of Zürich, had to take the field with the banner of a canton, which had always been borne by a priest. The Zürichers met their foes at Kappel, but were outnumbered and defeated, Zwingli being among the slain. A great bowlder, roughly squared, marks the place where he fell on Oct. 11, 1531.

Zygomorphous (*zig'ō-môr'fŭs*) **Flowers,** those in which the parts of a single set are not all alike. The term is chiefly applied to irregularity of petals. For example, in the sweet pea the petals are very much unlike. In most of the mints the five petals are so modified that two form an upper lip and three a lower lip, making the so-called bilabiate flower. The contrasting term is actinomorphic (*q. v.*) flowers. See FLOWER.

Zygospore (*zig'ō-spōr*) (in plants), a spore formed by the union of two similar gametes, as in some of the lower *Thallophytes* (*Spirogyra*, for example). It merely is a sexual spore or oöspore, but the name is convenient in indicating the nature of the gametes. The word "zygote" is sometimes used instead of zygospore.

Zyg'ote. See ZYGOSPORE.

ARITHMETIC.

THE FOREWORD.

The aim of this treatise on Arithmetic is

1. To develop the parts of the subject most likely to be of practical value to the pupil in after-life.
2. To eliminate subjects which perplex the pupil without affording any valuable mental discipline.

This work will be found especially valuable in the home, as it furnishes instruction and carefully graded exercises.

1. For pupils who fall behind their class on account of absence.
2. For pupils who are slow to comprehend the teacher's explanation.
3. For pupils who fail of promotion and who wish to study during the summer vacation.

The steps to be acquired by the pupil in the study of Arithmetic are

1. A knowledge of number.
2. The expression of number.
3. Power and skill in operations.
4. Logical and accurate thinking.

The teacher should realize that

1. Arithmetic deals with numbers not figures.
2. Primary ideas of numbers and of operations should be gained from objects.
3. Pupils must be thoroughly drilled on the fundamental operations of Arithmetic.
4. Pupils must be impressed with the importance of absolute correctness.

The pupil must be taught to interpret the language of the problem,

1. To know exactly what is given.
2. To know the relation of what is given, and from this knowledge to select the proper arithmetical process.
3. To perform the arithmetical process.
4. To forecast, when possible, the approximate answer.

Pupils should be urged to devise problems to be solved.

If a child does the work mapped out, drilling on the fundamentals, reading the problems carefully and thoughtfully, picturing the objects as they are described, he will, as a result, be ready to solve problems by abstract thinking.

ARITHMETIC.

Arithmetic is the study of numbers and their uses. Numbers are expressed by figures.

These figures are:

1	2	3	4	5	6	7	8	9	0
One,	Two,	Three,	Four,	Five,	Six,	Seven,	Eight,	Nine,	Zero.

The figure zero is never read. It merely indicates that that order is omitted.

Numbers greater than 9 are expressed by writing two or more figures side by side.

NUMERATION TABLE.

Trillions.	**Hundred-billions.**	**Ten-billions.**	**Billions.**	**Hundred-millions.**	**Ten-millions.**	**Millions.**	**Hundred-thousands.**	**Ten-thousands.**	**Thousands.**	**Hundreds.**	**Tens.**	**Units.**	**Decimal point.**	**Tenths.**	**Hundredths.**	**Thousandths.**	**Ten-thousandths.**	**Hundred-thousandths.**	**Millionths.**
4,	3	2	4,	2	0	8,	0	4	2,	2	8	9	.	0	0	2	4	8	2

Our system of numbers is based on the decimal system.

Every time we move a figure one place to the left of the decimal point, we multiply it by 10.

Every time we move a figure one place to the right of the decimal point, we divide it by 10.

Every three figures in any number, counting from the decimal point to the left, form a period.

Periods of figures are separated from each other by commas.

The names of the periods in order from the decimal point to the left are,

Trillions			Billions			Millions			Thousands			Units		
Hundred-trillions	Ten-trillions	Trillions	Hundred-billions	Ten-billions	Billions	Hundred-millions	Ten-millions	Millions	Hundred-thousands	Ten-thousands	Thousands	Hundreds	Tens	Units

We very seldom use numbers above millions.

Read each period as if it were a number by itself and then add the name of the period. As, 24, 306, 240. Twenty-four *million,* three hundred six *thousand,* two hundred forty. Use the word *and* between the whole number and the decimal.

Read the decimal as if it were a whole number, then add the name of the place of the right-hand figure.

0.4=4 tenths, 0.32=32 hundredths, 0.306=306 thousandths, etc. 24.03 =twenty-four and three hundredths.

Refer to the Numeration Table, and read the number given there.

Read the following numbers, referring to the Numeration Table if necessary:

2
44
825
7,286
18,427
10,010.02
405,000.405
1,250.6485
508.00406
800,001.024

248,629
4,804,232
56,875,084
250,428,376
4,775,842,205

485.65
4,768.054
2,002.4028
2.8
909.909
20,904.0904
402,300.24025
34,008.00012
3,468,000.0603
240,027.4206

Write in figures:

1. Sixty-seven thousand, four hundred.
2. Forty-four million, three hundred six thousand, forty-two.
3. Three hundred and three thousandths.
4. Fifteen thousand, three hundred and ten hundredths.
5. Eight hundred twenty-five and seven tenths.
6. Two thousand two and seven hundredths.
7. Ten thousand ten and seven thousandths.
8. Five thousand forty-seven hundred-thousandths.
9. One hundred twenty-three million, three hundred fifty-six thousand, four hundred eighty-eight.
10. Five million, four thousand sixty-three and twenty-four millionths.

The Romans used seven letters to represent numbers:

I	V	X	L	C	D	M
1,	5,	10,	50,	100,	500,	1000

All other numbers are expressed by writing two or more of these letters side by side.

When a letter is repeated, its value is repeated:

III=3, XX=20, CCC=300

When a letter, or a combination of letters, is placed after one of greater value, their sum is expressed:

VII=7, XV=15, XVII=17

When a letter of less value is written before one of greater value, their difference is expressed:

IV=4, XL=40, XC=90

When a bar is placed over a letter, its value is multipled by 1000:

$\overline{\text{V}}$=5000, $\overline{\text{XIV}}$=14,000

I	1	XI	11	XXI	21	D	500
II	2	XII	12	XXX	30	DC	600
III	3	XIII	13	XL	40	DCC	700
IV	4	XIV	14	L	50	DCCC	800
V	5	XV	15	LX	60	CM	900
VI	6	XVI	16	LXX	70	M	1000
VII	7	XVII	17	LXXX	80	MM	2000
VIII	8	XVIII	18	XC	90	$\overline{\text{IV}}$	4000
IX	9	XIX	19	C	100	$\overline{\text{V}}$	5000
X	10	XX	20	CC	200	$\overline{\text{IX}}$	9000

Write in figures the following:

XXIX
XLV
LXXVI
DXC
XCIV

CIX
CCXIX
MXCV
XXXIX
DCXC

LXIV
LXXV
MDCV
MCII
DCCX

MCMXI
MCMIV
$\overline{\text{X}}$DLII
$\overline{\text{C}}$DCC
DLIV

ADDITION.

Addition is the process of finding the *sum* of two or more numbers of the same kind.

The *sign* of addition is +, and is read *plus*.

The child should be taught the numbers through 10, and drilled until he responds automatically to any combination.

Primary ideas of numbers and of operations should be gained from objects, but gradually the objects should be eliminated as the pupil progresses in his knowledge of number.

The following combinations should be thoroughly mastered as a foundation for effective work in arithmetic:

2+0=2
1+1=2

3+0=3
2+1=3
1+2=3

4+0=4
3+1=4
2+2=4
1+3=4

5+0=5
4+1=5
3+2=5
2+3=5
1+4=5

6+0=6
5+1=6
4+2=6
3+3=6
2+4=6
1+5=6

7+0=7
6+1=7
5+2=7
4+3=7
3+4=7
2+5=7
1+6=7

8+0=8
7+1=8
6+2=8
5+3=8
4+4=8
3+5=8
2+6=8
1+7=8

9+0=9
8+1=9
7+2=9
6+3=9
5+4=9
4+5=9
3+6=9
2+7=9
1+8=9

10+0=10
9+1=10
8+2=10
7+3=10
6+4=10
5+5=10
4+6=10
3+7=10
2+8=10
1+9=10

Drill chart in addition where sums do not exceed 10:

2 1	5 2	4 4	6 3	7 3
6 4	3 1	4 3	8 2	6 1
5 4	9 1	3 2	5 5	8 1
2 2	7 2	4 1	7 1	4 5
5 1	4 2	6 2	5 3	3 3

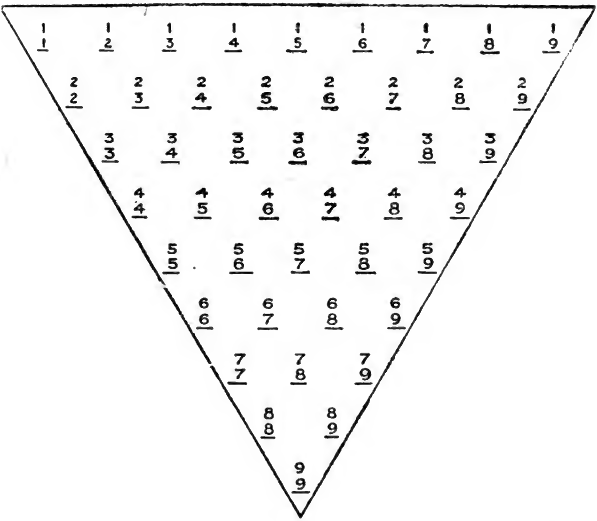
The teacher may point to any one of the combinations, requiring the pupil to answer promptly. Or the pupil may be asked to give the sums in a certain column from left to right, or from top to bottom.

Our system of numbers is a decimal system, and therefore in teaching the addition of numbers whose sum exceeds 10, as 7+5, we think that 3 added to 7 makes 10; hence

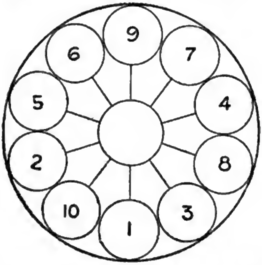
7+5=7+3+2=12
8+7=8+2+5=15
6+8=6+4+4=14

Much practice in this work will give a pupil great power in dealing with all numbers, and it will emphasize our decimal system.

The following chart gives every possible combination of the digits:



For rapid work in addition. Let the teacher write any number in the center circle. Pupils should promptly give the sum of the center figure and one of the outer figures to which the teacher may point.



Change the center figure often.

Add rapidly by lines and columns:

$$\begin{array}{ccccccccccc}
8 & + & 5 & + & 3 & + & 4 & + & 6 & = \\
5 & + & 4 & + & 6 & + & 9 & + & 2 & = \\
2 & + & 7 & + & 8 & + & 5 & + & 4 & = \\
3 & + & 9 & + & 4 & + & 6 & + & 8 & = \\
7 & + & 4 & + & 5 & + & 7 & + & 3 & = \\
4 & + & 6 & + & 7 & + & 8 & + & 2 & = \\
\hline
 & + & & + & & + & & + & & =
\end{array}$$

A chart like the above demands the pupils' close attention and ready response, if the teacher will point to a series of numbers in rapid succession.

Objective work in addition after 10 has been taught, should gradually give way to method.

Three classes of examples should be taught:

1. Where the sum of the units is less than 10,
   as 22+4; 33+5; 64+3, etc.
2. Where the sum of the units exactly equals 10,
   as 22+8; 33+7; 64+6, etc.
3. Where the sum of the units exceeds 10,
   as 22+9; 33+8; 64+9, etc.

Extend this work to numbers of more than two places in exactly the same way, emphasizing method of work.

428	486	596	482	825	645
351	214	678	675	642	547
				725	826
779	700	1274			

Add

$$\begin{array}{r}
425 \\
638 \\
764 \\
825 \\
655 \\
124 \\
\hline
31 \\
20 \\
32 \\
\hline
3431
\end{array}$$

In adding long columns it is often found convenient to write the sum of each column, placing the right-hand figure under the column added.

In case of error, it enables one to find the mistake with less difficulty.

A help to accuracy.

32+17+77+ 8+27+73+80+64+18=
47+31+43+32+78+47+ 7+72+92=
8+92+ 1+41+19+69+51+87+ 5=
19+67+ 5+ 9+35+49+93+44+14=
67+13+54+ 6+62+17+67+31+30=
98+71+30+80+30+ 9+13+47+75=
27+10+97+33+73+16+81+39+62=
80+ 9+83+42+17+ 8+63+33+27=
63+83+17+87+24+37+ 5+64+82=

+ + + + + + + + =

Add the above by columns and by lines.

Prove by comparing the sum total of the columns with the sum total of the lines.

EXERCISE 1.

Sales of a department store for the week ending September 30, 1911.

Days.	Dry Goods.	Boots and Shoes.	Furniture.	Kitchen Utensils.	Groceries.	Total.
Monday.......	$89.53	$40.75	$25.65	$41.58	$27.35	
Tuesday......	91.40	19.60	80.75	38.15	21.17	
Wednesday....	53.35	39.10	63.48	52.19	33.41	
Thursday.....	65.20	24.70	15.90	23.63	19.05	
Friday........	21.14	20.50	31.80	18.77	15.46	
Saturday.....	93.27	61.90	26.50	25.54	54.93	
Total.......						

Copy and complete the above statement. Prove by adding the vertical and horizontal totals.

EXERCISE 2.

Add vertically and horizontally the following statement of four weeks' cash receipts, February, 1909:

	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	Total.
1st....	$1068.17	$ 876.79	$ 729.17	$ 297.16	$ 98.09	$1119.44	
2nd....	987.26	749.02	813.65	361.19	407.63	1506.38	
3rd....	995.35	936.95	657.98	416.41	336.41	1324.75	
4th....	Feb. 22	1458.18	999.91	397.17	501.28	1207.67	
Total..							

SUBTRACTION.

Subtraction is the process of taking one number from another.

The terms used are the *minuend, subtrahend,* and *remainder.*

The *minuend* is the larger number, the number to be diminished.

The *subtrahend* is the smaller number, the number to be subtracted, or taken away.

The *remainder* is the difference between the minuend and the subtrahend.

The *sign* of subtraction is —, and is read *minus.*

The objective work in subtraction is carried along with the addition work.

As, 6+3=9.
9 take away 3=6.
9 take away 6=3.
6 and how many more make 9?
3 and how many more make 9?

A drill chart for subtraction of numbers up to 20.

3	7	4
6	◇	8
2	9	5

Any number from 10 to 20 may be written in the center space, and changed often to vary the drill.

What must be added to the outside number to give the center number?

The pupil should take the number pointed out, think how many must be added to it to make 10, and add to this last number the difference between the center number and 10.

Thus, if 7 is the number pointed out, and 18 is the center number, 3+8 will be the answer=11.

Repeated drill requiring pupils to think numbers at once by use of the decimal system, will prepare the way for quick and accurate work later.

Method of work.

From 457 take 268.

457
268
—— Write the subtrahend under the minuend.
189 Begin with the units to subtract.

We cannot take 8 units from 7 units, so we take 1 ten from the 5 tens (leaving 4 tens) and add it to the 7 units, making 17 units. We can now take 8 units from 17 units, leaving 9 units.

In like manner we cannot take 6 tens from 4 tens, so we take 1 hundred from the 4 hundreds (leaving 3 hundreds) and add it to the 4 tens, making 14 tens.

We can now take 6 tens from 14 tens, leaving 8 tens.

2 hundreds from 3 hundreds leaves 1 hundred.

Thus the difference is 189.

In doing the example the pupil thinks:—8 from 17 leaves 9; 6 from 14 leaves 8; 2 from 3 leaves 1.

Proof.—Add the remainder to the subtrahend. The sum should equal the minuend.

THE AUSTRIAN METHOD.

The Austrian method of subtraction emphasizes not so much what remains after taking the subtrahend from the minuend, as what must be added to the subtrahend to make the minuend.

This is also called the "shop" method, as it is generally employed in making change. Much practice along this line is recommended.

From 697 subtract 284.

697 By the Austrian method we say 4 units and 3 units=7 units.
284 Write 3 in the units' place. 8 tens and 1 ten=9 tens. Write 1 in
—— tens' place. 2 hundreds and 4 hundreds=6 hundreds. Write 4 in
413 hundreds' place, and the result is 413.

From 457 take 268.

457 The pupil should be guided to say 8 units and 9 units=17
268 units. Put down 9. 6 tens and 1 ten are 7 tens and 8 tens=15
—— tens. Put down 8. 2 hundreds and 1 hundred are 3 hundreds
189 and 1 hundred=4 hundreds. Put down 1, and the result is 189.

Add ten to each minuend digit that is smaller than the corresponding subtrahend digit, and make up for that by adding one to the next higher subtrahend digit.

EXERCISE 3.

Use the Austrian method in the following:

1. 1272—631
2. 1486—745
3. 2472—864
4. 1370—837
5. 1424—836
6. 1679—486
7. 3492—875
8. 1620—952

A man bought a lamp for 57c and gave the store-keeper a dollar bill. What change did the store-keeper return, giving as few pieces of money as possible?

He will give 3 cents, a nickel, a dime, and a quarter-dollar. The pupil will do his mental work in the following manner: 57 cents, 60 cents, 65 cents, 75 cents, 1 dollar.

Make change in the following examples, using as few pieces of money as possible:

	Amount of sale.	Money paid.
1.	29c	Half-dollar.
2.	37c	Quarter-dollar and 2 dimes.
3.	62c	Dollar.
4.	59c	Half-dollar and quarter-dollar.
5.	$ 1.24	$2 bill.
6.	$ 2.73	$5 bill.
7.	$ 3.78	$10 bill.
8.	$ 2.14	$2 bill and $1 bill.
9.	$ 1.16	$1 bill and half-dollar.
10.	$24.30	$20 bill and $10 bill.

Drill in Addition or Subtraction.

9	23	48	27	92	59	16	64	93
20	44	35	88	54	66	55	36	76
52	97	26	19	63	79	83	74	37
61	94	73	82		49	69	39	18
78	47	68	28		17	77	45	89
12	34	25	65	22	58	15	38	67
21	46	84	43	96	75	29	85	50
13	57	53	95	24	87	33	56	14

1. Place in center square any one of the nine digits. Have children add this digit to, or subtract it from the number to which the teacher may point.

2. Place in center square $1 or $2 and have pupils give change.

Drill in Addition and Subtraction.

78—3—4—5—7—9—3—5—2—7—5=
96—5—2—3—8—7—6—4—9—2—4=
87—6—5—9—3—1—7—3—4—5—7=
79—3—8—7—6—9—4—6—5—2—3=
85—2—5—6—5—7—7—3—2—4—6=
99—4—6—8—7—5—3—1—4—8—9=
73—4—5—2—3—4—1—7—2—3—6=
82—5—6—3—7—9—3—4—6—4—7=
93—6—5—2—9—8—7—4—3—5—8=
89—4—3—6—7—8—5—2—4—7—6=
— — — — — — — — — — — =

Perform the subtractions indicated in the horizontal rows.

Add the vertical columns and perform the subtractions indicated.

EXERCISE 4.

1. Mr. Johnson owed $75.25, $42.75, and $375.50. He paid $316.35. How much did he still owe?

2. A house that cost $7875 was sold for $9050. What was the gain?

3. I bought a farm for $8650, and sold it for $7825. How much did I lose?

4. A man was born in 1865 and died in 1911. How old was he when he died?

5. I bought a horse for $225, and a carriage for $170. I sold both for $425. Did I gain or lose, and how much?

6. Mr. Wilson bought a lot of land for $1250. He built a house on it for $7650, and a stable that cost $1575. He paid $115 insurance on it and $95 for taxes. He sold it so as to gain $1275. What did he get for it?

7. Had he sold it for $12,875, how much would he have made?

8. A business man deposits in a bank for a week, $425, $284, $425.75, $865.72, $470, $294. He gives checks for $125, $324.80, $215 and $565.82. Find the balance in the bank.

9. What must be added to the sum of \$320.50 and \$165.25 to make \$510?

10. The sum of two numbers is 154,682, and the greater number is 96,247. What is the less number?

MULTIPLICATION.

Multiplication is the process of taking one number as many times as there are units in another.

The terms used are *multiplicand, multiplier* and *product.*

The *multiplicand* is the number to be multiplied.

The *multiplier* is the number by which we multiply.

The *product* is the result of the multiplication.

The *sign* of multiplication is ×, and is read **times.**

The product of two numbers is the same whichever is made the multiplier.

The multiplier must always be an abstract number.

The multiplicand may be either an abstract or a concrete number.

The product will always be of the same denomination as the multiplicand.

A thorough knowledge of the multiplication tables is absolutely necessary.

$1 \times 1 = 1$
$1 \times 2 = 2$
$1 \times 3 = 3$
$1 \times 4 = 4$
$1 \times 5 = 5$
$1 \times 6 = 6$
$1 \times 7 = 7$
$1 \times 8 = 8$
$1 \times 9 = 9$
$1 \times 10 = 10$

$2 \times 1 = 2$
$2 \times 2 = 4$
$2 \times 3 = 6$
$2 \times 4 = 8$
$2 \times 5 = 10$
$2 \times 6 = 12$
$2 \times 7 = 14$
$2 \times 8 = 16$
$2 \times 9 = 18$
$2 \times 10 = 20$

$3 \times 1 = 3$
$3 \times 2 = 6$
$3 \times 3 = 9$
$3 \times 4 = 12$
$3 \times 5 = 15$
$3 \times 6 = 18$
$3 \times 7 = 21$
$3 \times 8 = 24$
$3 \times 9 = 27$
$3 \times 10 = 30$

$4 \times 1 = 4$
$4 \times 2 = 8$
$4 \times 3 = 12$
$4 \times 4 = 16$
$4 \times 5 = 20$
$4 \times 6 = 24$
$4 \times 7 = 28$
$4 \times 8 = 32$
$4 \times 9 = 36$
$4 \times 10 = 40$

$5 \times 1 = 5$
$5 \times 2 = 10$
$5 \times 3 = 15$
$5 \times 4 = 20$
$5 \times 5 = 25$
$5 \times 6 = 30$
$5 \times 7 = 35$
$5 \times 8 = 40$
$5 \times 9 = 45$
$5 \times 10 = 50$

$6 \times 1 = 6$
$6 \times 2 = 12$
$6 \times 3 = 18$
$6 \times 4 = 24$
$6 \times 5 = 30$
$6 \times 6 = 36$
$6 \times 7 = 42$
$6 \times 8 = 48$
$6 \times 9 = 54$
$6 \times 10 = 60$

$7 \times 1 = 7$
$7 \times 2 = 14$
$7 \times 3 = 21$
$7 \times 4 = 28$
$7 \times 5 = 35$
$7 \times 6 = 42$
$7 \times 7 = 49$
$7 \times 8 = 56$
$7 \times 9 = 63$
$7 \times 10 = 70$

$8 \times 1 = 8$
$8 \times 2 = 16$
$8 \times 3 = 24$
$8 \times 4 = 32$
$8 \times 5 = 40$
$8 \times 6 = 48$
$8 \times 7 = 56$
$8 \times 8 = 64$
$8 \times 9 = 72$
$8 \times 10 = 80$

$9 \times 1 = 9$
$9 \times 2 = 18$
$9 \times 3 = 27$
$9 \times 4 = 36$
$9 \times 5 = 45$
$9 \times 6 = 54$
$9 \times 7 = 63$
$9 \times 8 = 72$
$9 \times 9 = 81$
$9 \times 10 = 90$

$10 \times 1 = 10$
$10 \times 2 = 20$
$10 \times 3 = 30$
$10 \times 4 = 40$
$10 \times 5 = 50$
$10 \times 6 = 60$
$10 \times 7 = 70$
$10 \times 8 = 80$
$10 \times 9 = 90$
$10 \times 10 = 100$

The multiplication tables may be extended beyond 10, but for all practical and immediate use it is quite as well to stop at 10.

The facts of multiplication as found in the tables should be thoroughly memorized.

Have children add by numbers: as, 7, 14, 21, 28, etc., 9, 18, 27, 36, etc.

Good drill,—

4×6+2   7×5—6
3×8+5   8×4—3

Method of work.

Multiply 428 by 536.

428
536

2568	428×6 units	=	2568 units
1284	428×3 tens	=	1284 tens
2140	428×5 hundreds	=	2140 hundreds
229,408	428×536	=	229408 units

Place the right-hand figure of each partial product under the figure of the multiplier which produces it.

Multiply 4862 by 4006.

4862
4006
29172
19448
19,477,172

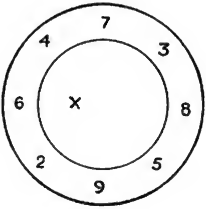
When there are ciphers in the multiplier it is not necessary to multiply by them. Keep in mind that the first figure of each partial product is to be written directly under the figure of the multiplier which produces it. This saves the work of writing the row of 0's.

Multiply 482 by 10; 482 by 100.

482	482
10	100
4,820	48,200

If the multiplier is 10, annex one cipher to the multiplicand; if 100, annex 2 ciphers, etc.

The following drill will help fix in the mind the facts of the multiplication table.



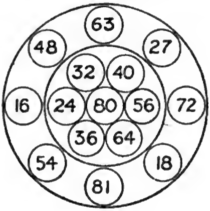
Draw the diagram on the blackboard. Frequently change the centre number. Let the teacher or some pupil point to a number in the outer rim, requiring the children to give at once the product.

Drill in multiplication.

50	6	10	7	3	9	5	12	2	8	11	1	4	20
4													
7													
2													
5													
8													
3													
9													
1													
6													
12													
10													
11													
40													

Pupils should copy and fill in vacant squares, using numbers in vertical column as multipliers.

The following drill is effective in securing the desired quickness, as pupils make use of facts learned in the multiplication tables.



Let the pupil tell the multiplier and multiplicand as the teacher points to the numbers.

For example, the teacher points to 36, the pupil answers 6×6 and 4×9.

EXERCISE 5.

Find the product:

1. 895×789
2. 873×597
3. 764×854
4. 578×806
5. 786×908
6. 607×407
7. 502×750
8. 432×560
9. 630×480
10. 508×680
11. 970×806
12. 405×706
13. 430×403
14. 145×200
15. 94086×5761
16. 75486×4080
17. 50695×5408
18. 40046×7008
19. 87654×5050
20. 21452×8070
21. 31805×7500

EXERCISE 6.

1. What is the value of 82 tons of hay at $18.75 per ton?

2. If it cost $35,868 to build a mile of railroad, what will it cost to build 38 miles?

3. At the rate of 52 bushels per acre, how much corn can be raised on 372 acres of land?

4. A real estate company bought 75 acres of land at $62.50 per acre, and 54 acres at $78 per acre. They sold the whole at $75.25 per acre. How much did they gain or lose?

5. A grain dealer bought 5872 bushels of wheat in Chicago at 59c a bushel and shipped it to Boston at a cost of 3c per bushel. He sold it in Boston for 68c per bushel. What was his gain?

DIVISION.

Division is the process of finding how many times one number is contained in another.

The terms used are the *dividend*, *divisor*, *quotient*, and *remainder*.

The *dividend* is the number divided.

The *divisor* is the number by which we divide, and shows the size of each part.

The *quotient* is the result, and shows the number of equal parts.

The *remainder* is the part of the dividend left.

The *sign* of division is ÷, and is read *divided by*.

The divisor and quotient are factors (makers) of the dividend.

Thus to prove division, we multiply the divisor by the quotient, and to the product we add the remainder, if there is one. The result should be the dividend.

Division may be expressed in the following ways:

$$\begin{array}{r}5\\4\overline{)20}\end{array}$$ usual form.

$20 \div 4 = 5$ using the sign.

$\frac{20}{4} = 5$ fractional form.

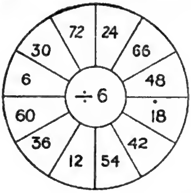
20:4 ratio method.

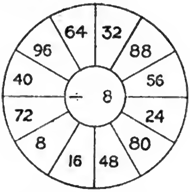
Dividing a number into two equal parts is the same as finding one-half (½) of it.

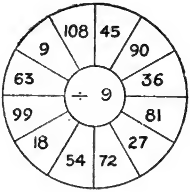
Dividing a number into three equal parts is the same as finding one-third (1/3) of it.

So in the following drill, dividing the numbers in the outer rings by 6, 8, 9, is the same as finding one-sixth (1/6), one-eighth (⅛), one-ninth (1/9) of them.

These diagrams should be placed upon the board, and as the teacher or some pupil points to a number in the outer ring, the pupils should give the quotient quickly and correctly.







SHORT DIVISION.

Short division is simple and the method of work is readily learned.

Divide 8527 by 9.

$$\begin{array}{r}947\frac{4}{9}\\9\overline{)8527}\end{array}$$

85 hundreds ÷ 9=9 hundreds and 4 hundreds remaining; we write 9 over the hundreds' column. 4 hundreds and 2 tens =42 tens; 42 tens ÷ 9=4 tens and 6 tens remaining; we write 4 over the tens' column. 6 tens and 7 units =67 units; 67 units ÷ 9=7 units and 4 units remaining; we write 7 over the units' column, and the remainder 4 over the divisor 9 with a line between, to show that 4 is still to be divided by 9.

Give a great many examples like the above. It is one of the best mental drills, and prepares the way for long division.

Much of the slow, inaccurate work in arithmetic is due to a lack of drill along the line of multiplication and division.

To prove an example in division, multiply the quotient by the divisor, and add the remainder, if there is one.

EXERCISE 7.

Divide and prove the following:

1. $6\overline{)568}$
2. $8\overline{)9655}$
3. $9\overline{)15432}$
4. $7\overline{)98746}$
5. $10\overline{)76482}$
6. $8\overline{)200416}$
7. $7\overline{)4732}$
8. $4\overline{)2116}$
9. $5\overline{)24806}$
10. $6\overline{)85429}$
11. $9\overline{)46681}$
12. $6\overline{)15116}$
13. $5\overline{)5263}$
14. $3\overline{)2004}$
15. $7\overline{)19019}$
16. $8\overline{)34702}$
17. $5\overline{)84763}$
18. $7\overline{)34816}$
19. $9\overline{)6248}$
20. $6\overline{)5084}$
21. $4\overline{)49048}$
22. $3\overline{)15161}$
23. $2\overline{)14631}$
24. $4\overline{)648161}$

LONG DIVISION.

Divide 8401 by 31.

```
    271
31)8401
   62
   ——
   220
   217
   ———
     31
     31
     ——
      0
```

The process of long division is the same as that of short division, except that in long division we express the successive partial dividends.

We find the quotient figure by comparing the first one, or the first two dividend figures with the first divisor figure.

In the above example:

3 is contained in 8, 2 times.
3 is contained in 22, 7 times.
3 is contained in 3, once.

Thus the quotient is 271.

Always place the quotient figure directly over the dividend figure that produced it.

Divide 8401 by 82.

$$102\tfrac{37}{82}$$

```
82)8401
   82
   —
    201
    164
    ———
     37 remainder.
```

Examples where we have zero in the quotient often give trouble.

Practice, however, does away with the difficulty.

We find in the above example that 82 from 84 leaves a remainder of 2: bring down the 0. We see that 82 is not contained in 20; write 0 in the quotient directly over the dividend figure which was last brought down, and bring down the next figure 1. 82 is contained in 201 twice. Thus the quotient is 102 with a remainder of 37.

If after bringing down another figure the divisor is still larger than the partial dividend, write another 0 in the quotient, and bring down the next quotient figure.

Divide 8401 by 39.

$$\begin{array}{r} 215\frac{16}{39} \\ 39\overline{)8401} \\ 78 \\ \hline 60 \\ 39 \\ \hline 211 \\ 195 \\ \hline 16 \end{array}$$
remainder.

This example differs from the preceding examples in that the second divisor figure is a large number. 39 is so much nearer 40 than 30, we must find the quotient figures by comparing the first one or first two dividend figures with 4 as a trial divisor rather than 3.

4 is contained in 8, 2 times.
4 is contained in 6, once.
4 is contained in 21, 5 times.

Thus the quotient is 215 with a remainder of 16.

In general, if the second divisor figure is 1, 2, or 3, the first divisor figure is the trial divisor. If the second divisor figure is 7, 8, or 9, the trial divisor should be one more than the first divisor figure. If the second divisor figure is 4, 5, or 6, the trial divisor may be the first divisor figure, or one more than the first divisor figure.

Practice will show.

First. If the product is greater than the partial dividend, the quotient figure is too large.

Second. If the remainder is greater than the divisor, the quotient figure is too small.

Divide 26,874 by 44.

$$\begin{array}{r} 610\frac{3}{4} \\ 44\overline{)26874} \\ 264 \\ \hline 47 \\ 44 \\ \hline 34 \end{array}$$
remainder.

In an example of this kind care must be taken not to omit the last 0 in the quotient.

8752÷ 10=875 and 2 remainder.

8752÷ 100= 87 and 52 remainder.

8752÷1000= 8 and 752 remainder.

A number may be divided by 10, 100, 1000, etc., by cutting off as many dividend figures from the right, as there are ciphers on the right of the divisor. The figures cut off will be the remainder, the rest will be the quotient.

12,000÷30 is the same as 1200÷3.

Cutting off the same number of ciphers from the right of both dividend and divisor, does not change the quotient.

EXERCISE 8.

1. 9072÷21
2. 22050÷42
3. 44667÷63
4. 10086÷82
5. 39831÷51
6. 29756÷43
7. 29757÷91
8. 29408÷32
9. 60152÷73
10. 22356÷81
11. 3074÷29
12. 33630÷57
13. 15466÷38
14. 79344÷87
15. 32046÷49
16. 68748÷68
17. 195702÷78
18. 291388÷97
19. 15249÷39
20. 435888÷48
21. 143278÷142
22. 267167÷369
23. 1056852÷525
24. 1686656÷395
25. 2489592÷406
26. 1217958÷1234
27. 3839112÷4506
28. 2875166÷574
29. 4189510÷6253
30. 1537763÷5009

EXERCISE 9.

1. 24 tons of hay cost $432. What is the price per ton?

2. How many cows at $42 a head, will $36,750 buy?

3. The weekly wages of 110 men are $1320. How much per day does each man receive?

4. If I receive $80 and spend $50 per month, in how many years of 12 months each shall I save $2,880?

5. If the divisor is 16, the quotient 42, and the remainder 11, what is the dividend?

6. A farmer produces 19,592 bushels of corn from 316 acres of land. What is the average yield per acre?

7. A man sells two houses at $4,350 each. With the proceeds he buys land at $75 per acre. How many acres does he buy?

8. If a man pays $24 rent a month, in how many years of 12 months each will he pay $3,546 rent?

9. A man paid $327 for a mowing machine and hired help to run it at $4.50 per day. He let the machine at $7.50 per day, including the help he hired. How many days must he let the machine to pay its first cost?

10. Mr. Jackson bought 22 cords of wood for $132. For how much per cord must he sell it to gain $44 on the whole?

DECIMAL FRACTIONS.

Decimal fractions, usually called decimals, express one or more of the decimal divisions of a unit. Decimal fractions are generally expressed by writing the numerator only, the denominator being shown by the position of the decimal point, as illustrated by the following:

.4	four tenths.
.04	four hundredths.
.004	four thousandths.
.0004	four ten-thousandths.
.00004	four hundred-thousandths.
.000004	four millionths.

Read the decimal as if it were a whole number, then add the name of the place of the right-hand figure.

A whole number with a decimal is called a mixed decimal.

In reading a mixed decimal, use the word *and* between the whole number and the decimal.

Much drill in reading and writing decimals is desirable.

Read the following:

.408
.0506
.0458
.0050
.00401
.02000
32.037
20.070
9.009
.000058
.000506
.002600

Express the following in decimal form:

$\frac{3}{10}$ $\frac{5}{10}$ $\frac{45}{100}$ $\frac{62}{100}$ $\frac{320}{1000}$ $\frac{475}{1000}$ $8\frac{4}{10}$ $32\frac{4}{100}$

7 tenths
8 hundredths
32 hundredths
425 thousandths
62 thousandths
6 thousandths
8 and 6 tenths
12 and 6 hundredths
15 and 6 thousandths

ADDITION AND SUBTRACTION OF DECIMALS.

Use same method as in whole numbers.

Arrange units of the same order in the same column.

Keep the decimal points one under another.

Place the decimal point in the answer directly under the decimal points in the example.

EXERCISE 10.

Addition:

1. 2.457+3.576+8.01+.4592+82.4070
2. 9.423+732.01+62.+8.4067+4.04863
3. 24.84+8.531+.4004+6.07
4. 14.4278+3.042+2.0046+.8795+3.6745+.297
5. 2.243+5.1462+3.0481+.72546+.04652

Subtraction:

6. 624.278—125.564
7. 863.581—132.472
8. 145.6—64.58
9. 6.02—2.006
10. 2.308—.0024
11. 4.4—.62
12. 14.08—1.846
13. .06—.025
14. 606.48—288.09
15. .8—.08
16. 65.800—19.014
17. 12.001—9.00046
18. .4875—.22
19. .0375—.0028
20. 27.475—1.866

MULTIPLICATION OF DECIMALS.

To multiply a decimal by 10, move the decimal point one place to the right.

To multiply a decimal by 100, move the decimal point two places to the right.

Multiply the following by 10, by 100, and by 1000 by moving the decimal point.

.4	.046	.0085	.485
.25	.845	.062	.0628
.405	.476	.0486	.0082

Multiply 2.375 by 600.

$$\begin{array}{r} 237.5 \\ 6 \\ \hline 1425.0 \end{array}$$

First multiply the multiplicand by 100 by moving the decimal two places to the right. Then multiply by 6.

To multiply a decimal by a whole number, multiply as with whole numbers, and then point off as many places in the product as the multiplicand has decimal places.

EXERCISE 11.

1. 4.856×400
2. 5.408×3200
3. 64.042×2000
4. 184.64×600
5. 261.1 ×7200
6. 34.0062×9000
7. 100.65 ×1200
8. .0048 ×8000

Multiply 36.4 by .6.

$$\begin{array}{r} 36.4 \\ 6 \\ \hline 21.84 \end{array}$$

This means to find $\frac{6}{10}$ of 36.4.

$\frac{1}{10}$ of $36.4 = 3.64$.

$\frac{6}{10} = 6 \times 3.64 = 21.84$.

To multiply a decimal by a decimal, multiply as with whole numbers and point off as many decimal places in the product as there are in both multiplicand and multiplier together.

EXERCISE 12.

1. 4.878×3.816
2. 67.50×1200
3. 1.008×4.004
4. .047×.75
5. 6.004×3.07
6. .0101×6.06
7. 4.072×.004
8. 16.32×2.020
9. .1672×6.204
10. 72.04×.09

DIVISION OF DECIMALS.

To divide a decimal by 10, move the decimal point one place to the left.

To divide a decimal by 100, move the decimal point two places to the left.

Divide the following by 10, by 100, by 1000, by moving the decimal point:

.4	1.406	8.04	75.06
.25	24.08	6.003	54.04
.405	.5825	.62	112.5

Divide 601.26 by 600.

$$\begin{array}{r} 1.0021 \\ 6\overline{)6.0126} \end{array}$$

First divide the dividend by 100 by moving the decimal point two places to the left, then divide by 6, placing the decimal point in the quotient directly over the decimal point in the dividend.

EXERCISE 13.

1. 74.40÷60
2. 680.4÷4200
3. 128.÷800
4. 15540.÷7000
5. 46.40÷40
6. 43.2÷2400
7. 24.64÷1100
8. 9.÷600

8÷4=2.

Multiply both dividend and divisor by 2.

16÷8=2 and the quotient is the same.

Multiplying both dividend and divisor by the same number does not change the quotient.

This is a most valuable principle to remember, and it is used in the following examples:

Divide 1.806 by .43.

$$\begin{array}{r} 4.2 \\ .43_\wedge\overline{)1.80_\wedge6} \\ \underline{172} \\ 86 \\ \underline{86} \end{array}$$

Multiply both dividend and divisor by 100 by moving the decimal point two places to the right. This makes the divisor a whole number. Place the decimal point in the quotient directly over the decimal point thus established in the dividend.

Divide 6.4938 by .242.

```
           26.833
.242∧)6.493∧800
      484
      1653
      1452
       2018
       1936
         820
         726
          940
          726
```

Multiply both dividend and divisor by 1000 by moving the decimal point three places to the right, thus making the divisor a whole number.

When the dividend does not contain the divisor evenly, add ciphers and continue to divide.

Ciphers added to the right of a decimal point do not change the value of a number.

Three decimal places in the quotient are usually sufficient.

EXERCISE 14.

1. 86.07÷28.5
2. 175.552÷4.16
3. 2.5956÷72.1
4. 28.764÷9.4
5. 3398.448÷84.12
6. 10.625÷.25
7. 17.4216÷8.54
8. 469.872÷4.68
9. .5750÷.046
10. 5328.96÷62.4
11. .3856÷.004
12. 8.194÷96.4
13. 1.0764÷.023
14. .0368÷.0004
15. 447.12÷4.86
16. .08244÷.018
17. 3.71027÷.807
18. 53.4404÷62.14
19. .27468÷.0042
20. .7140÷.4200
21. 59.7408÷7.84
22. .12012÷.0182
23. .04925÷.005
24. .0005÷5000

EXERCISE 15.

What is the cost of

1. 8200 shingles at $3.75 per thousand?
2. 4875 pounds of coal at $6.75 per ton? (2000 lb. = 1 ton).
3. 5750 envelopes at $1.37 per thousand?
4. 12832 railroad ties at $14.75 per hundred?
5. 972 feet of lumber at $22.75 per thousand?
6. 8725 feet of lumber at $28.50 per thousand?
7. 3375 laths at 22½c per hundred?
8. 4860 bricks at $8.95 per thousand?
9. 382 pounds of pork at $9.75 per hundred?
10. 6485 pounds of coal at $7.25 per ton?
11. 3840 feet of boards at $35 per thousand?
12. 4840 chestnut rails at $3.95 per hundred?

EXERCISE 16.

Miscellaneous problems.

1. A farmer raised 6750 bushels of corn from 150 acres of land, at an average of $6.35 per acre. How much will he gain if he sells the whole at 24c per bushel?

2. For how much coal at $6.75 per ton, will $119.50 pay?

3. A real estate dealer bought 78 acres of land for $3250, and sold it for $3500.50. How much did he gain per acre?

4. The last reading of my gas meter was 68500 cubic feet. The previous reading was 62800 cubic feet. At $1.05 a thousand find the amount of my bill.

5. If a boy earns $5.75 a week, how many weeks will it take him to earn $281.75?

UNITED STATES MONEY.

10 mills=1 cent (c)
10 cents=1 dime
10 dimes=1 dollar ($)
10 dollars=1 eagle (E)

The coins of the United States are authorized by law.

They are,—

Gold, the double-eagle, eagle, half-eagle, quarter-eagle.

Silver, the dollar, half-dollar, quarter-dollar, dime.

Nickle, the five-cent piece.

Bronze, the cent.

Paper money in the form of treasury notes, bank notes, gold and silver certificates, is extensively used in place of coins.

The dollar, being the standard unit of value in the United States, is written at the left of the decimal point; dimes, cents, and mills, being tenths, hundredths and thousandths of the dollar, are expressed at the right of the decimal point.

The mill is not coined, but the term is used in speaking of the fractional part of a cent. In business transactions it is customary to regard 5 mills or more as 1 cent, and to omit less than 5 mills.

The terms eagle and dime are not much used. Eagles and dollars are read as dollars, and dimes and cents are read as cents. Thus, $65.274 is read sixty-five dollars, twenty-seven cents, four mills.

Read the following as dollars, cents, and mills:

$ 8.436	$ 42.655	$ 0.426	$ 125.048
$25.406	$485.722	$148.329	$1250.581

BILLS AND ACCOUNTS.

A *bill* is a written statement of goods sold, or services rendered, giving the date of the transactions, the names of the parties, items, cost of each, and the amount of the whole.

An *account* is the record of business transactions between two parties.

The *debtor* (Dr.) is the person who buys the goods or receives the service.

The *creditor* (Cr.) is the person who sells the goods or renders the service.

A bill becomes a *receipt* when the creditor or his authorized agent writes "Received payment" and signs his name.

Edward Walker bought of Frank Carter & Co., March 5, 1911, 10 bbl. flour at $7.25, 400 lb. granulated sugar at 4½c, 60 lb. butter at 30c, 100 lb. tea at 42c. Edward Walker pays for the goods and receives the following receipted bill from Frank Carter & Co.:

Boston, Mass., March 5, 1911.

Mr. Edward Walker.

Bought of Frank Carter & Co.

	10 bbl. flour	@ $7.25	72	50		
	400 lb. gran. sugar	@ .04½	18	00		
	60 lb. butter	@ .30	18	00		
	100 lb. tea	@ .42	42	00	150	50

Received payment,
FRANK CARTER & Co.,
By C. D.

A second form for the above is often used:

Boston, Mass., March 5, 1911.

Mr. Edward Walker.

To Frank Carter & Co., Dr.

This means that Edward Walker is debtor to Frank Carter & Co. for the goods mentioned in the bill.

David Grant sells A. A. Evans, April 2, 1911, 1 bbl. St. Louis flour at $6.75, 3 lb. currants at 15c. April 8, 1911, 4 lb. Rio coffee at 25c, 3 lb. Smyrna figs at 20c.

April 20, 1911, David Grant pays on account $5.00.

April 30, 1911, David Grant sells A. A. Evans 5 lb. Vermont butter at 32c, and A. A. Evans brings David Grant ½ cord wood at $6.50 per cord.

The following illustrates the ledger account of the above transactions as shown on the books of David Grant in account with A. A. Evans:

Dr. A. A. Evans. Cr.

1911					1911				
April	2	1 bbl. St. Louis flour	6	75	April	20	Cash	5	00
		3 lb. currants @.15		45	"	30	½ cord wood @6.50	3	25
"	8	4 lb. Rio coffee @.25	1	00					
		3 lb. Smyrna figs@.20		60					
"	30	5 lb. Vt. butter @.32	1	60			Balance	2	15
			10	40				10	40
May	1	Balance	2	15					

The difference between the sum of the debits and the sum of the credits is called the *balance.*

The balance is entered on the less side of the account, and makes the footings of the two sides equal.

Entering the balance and the footings, and drawing the proper lines as above, is called *closing* or *balancing the account.*

May 1, 1911, David Grant presents to A. A. Evans his bill, which is settled and receipted as follows:

Trenton, N. J., May 1, 1911.

Mr. A. A. Evans.

To David Grant, Dr.

April	2	1 bbl. St. Louis flour	@ 6.75	6	75		
		3 lb. currants	@ .15		45		
	8	4 lb. Rio coffee	@ .25	1	00		
		3 lb. Smyrna figs	@ .20		60		
	30	5 lb. Vermont butter	@ .32	1	60	10	40
		Cr.					
April	20	By cash		5	00		
	30	By ½ cord wood	@ 6.50	3	25	8	25
		Balance				2	15

Received payment,

David Grant.

Transactions.

Sept. 4, 1911, William Baxter buys of the Dwight Lumber Co., of Detroit, Michigan, on account

7500 shingles at \$3.50 per M.
1450 ft. pine at \$34.50 per M.
8250 ft. hemlock at \$22.25 per M.

Sept. 20, 1911, Wm. Baxter buys of Dwight Lumber Co. on account

1500 ft. boards at \$24.00 per M.
2750 cedar posts at \$12.50 per C.

Oct. 12, 1911, Wm. Baxter pays \$115 on his account.

Nov. 15, 1911, Wm. Baxter pays \$45 on his account.

Dec. 4, 1911, Wm. Baxter *pays the balance* of his account.

Render an itemized account, Sept. 30, 1911.

Render a statement, Oct. 31, 1911.

Render a statement, Nov. 30, 1911.

Receipt the last statement in full, Dec. 4, 1911.

When payments are made on an account, a receipt is given for the sum paid. The following was given to A. A. Evans:

\$5.00 Trenton, N. J., April 20, 1911.

Received of A. A. Evans, five dollars on account.

DAVID GRANT.

CASH ACCOUNT.

A *cash account* is a record of all money received and paid out.

Put on debit side all money on hand or money received.

Put on credit side all money paid out.

Balance a cash account in the same way as a ledger account.

1911		Cash.	Dr.		Cr.	
Jan.	1	Cash on hand	225	00		
	5	Paid insurance			35	00
	10	Received check	74	00		
	18	Paid telephone			3	40
	24	Paid coal bill			48	00
	28	Received salary	195	00		
		Balance on hand			407	60
Feb.	1	Balance brought forward	407	60		

BUSINESS EXERCISES.

Transactions.

Jan. 10, 1911, Frank Brown buys of C. E. Wood, of Chicago, on account,

20 yd. silk at $1.25.
3 yd. lining at 25c.
¾ yd. lace at $2.40.
1 doz. men's linen handkerchiefs at $2.00.
36 yd. muslin at 12½c.

Jan. 17, 1911, Frank Brown buys of C. E. Wood, on account,

2 pr. gloves at $1.65.
10 yd. ribbon at 19c.
1 pr. shoes at $3.25.

Mar. 13, 1911, Frank Brown buys of C. E. Wood, on account,

20 yd. flannel at 45c.
8 doz. buttons at 12c.

Apr. 15, 1911, Frank Brown pays C. E. Wood, on account,

Cash $25.00.

May 20, 1911, Frank Brown pays C. E. Wood cash to balance account.

Make out and render itemized bill, Jan. 31, 1911.
Render a statement, Feb. 28, 1911.
Make out the account to be rendered, Mar. 31, 1911.
Render a statement, April 29, 1911.
Receipt the last statement in full, May 20, 1911.

Chicago, Ill., March 31, 1911.

Mr. Frank Brown.

To C. E. Wood, Dr.

1911		To account rendered Feb. 28, 1911				38	00
Mar.	13	20 yd. flannel	@ .45	9	00		
		8 doz. buttons	@ .12		96	9	96
						47	96

Chicago, Ill., April 29, 1911

Mr. Frank Brown.

To C. E. Wood, Dr.

1911		To account rendered March 31, 1911			47	96
		Cr.				
April	15	By cash	25	00	25	00
		Balance			22	96

Chicago, Ill., May 20, 1911.

Mr. Frank Brown.

To C. E. Wood, Dr.

		To balance on account.			22	96
		Received payment in full.				
		C. E. Wood.				

Chicago, Ill., January 31, 1911.

Mr. Frank Brown.

To C. E. Brown, Dr.

1911 Jan.	10	20 yd. silk	@ $1.25	25	00		
		3 yd. lining	@ .25		75		
		¾ yd. lace	@ 2.40	1	80		
		1 doz. men's linen hdkfs.	@ 2.00	2	00	29	55
	17	2 pr. gloves	@ 1.65	3	30		
		10 yd. ribbon	@ .19	1	90		
		1 pr. shoes	@ 3.25	3	25	8	45
						38	00

STATEMENT.

Chicago, Ill., Feb. 28, 1911.

Mr. Frank Brown.

To C. E. Wood, Dr.

		To account rendered Jan. 31, 1911			38	00

EXERCISE 17.

Make out bills for the following sales, inserting date, name, and address of purchaser and dealer when wanting:

1. Charles Adams buys of Hall and Lane 75 lb. sugar at 4½c; 32 lb. coffee at 28c; 12 bbl. flour at $6.75; 56 lb. lard at 13½c.

2. April 4, 1911, James Burgess sells 2 cows at $50; 1 horse at $150; 1 wagon at $58.50; 1 sleigh at $75; 2 harnesses at $37.50.

3. Sell to your neighbor the following goods: 10 lb. sugar at 4½c; 3 doz. eggs at 28c; 5 lb. coffee at 34c; 3 lb. tea at 48c; 4½ lb. butter at 32c; 1½ lb. cheese at 24c.

4. Mr. Edward Saunders buys of R. S. Holmes & Co. 6 pairs men's shoes at $3.75; 8 pairs slippers at $1.25; 8 pairs women's shoes at $3.20; 5 pairs boys' shoes at $1.37½.

5. Louis P. Whipple & Co. sell to Mrs. Ernest Miller 18 rolls of wall paper at 12½c; 44 yards of border at 7¾c; 122 feet of molding at 7½c.

6. Bill for dry goods: 12 yd. crash at 15c; 1 doz. napkins at $2.50; 2 table-cloths at $2.75; 45 yd. sheeting at 12½c; 10 pillow slips at 20c.

7. Chandler and Sears bought of R. H. Mitchell & Co. 5½ doz. cups and saucers at $5.50; 12 doz. tumblers at $1.10; 5 doz. plates at $4.25; 2½ doz. bowls at $1.10; 6 doz. mugs at 70c.

8. March 1, 1911, you buy of John Morrill 8 collars at $1.50 per dozen; 6 pairs cuffs at $3.00 per dozen; 4 shirts at $1.25; 3 neckties at 50c. John Morrill presents his bill April 1, 1911.

FACTORS AND MULTIPLES.

FACTORING.

When we divide a number into two numbers which, multiplied together, give a product equal to the given number, we have found the *factors* of that number.

Finding the factors of a number is called *factoring.*

Name two factors of 16, 20, 28, 33, 35, 48, 56, 64, 72.

Name three factors of 12. $12=4\times3=2\times2\times3$.

The three factors of 12 are 2, 2, and 3.

What three factors produce 18, 28, 30, 36, 40?

A *composite number* is a number that has other factors besides itself and 1; as 10, 16, 28, etc.

A *prime number* is a number that has no other factors than itself and 1; as 1, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, etc.

A *prime factor* is a prime number that is a factor.

4 and 9 are factors of 36
3 and 12 " " " 36
2 and 18 " " " 36
6 and 6 " " " 36

but the prime factors of 36 are 2, 2, 3, and 3.

From this illustration we see that a number may have two or more sets of factors, but there can be only one set of prime factors.

A simple method of *finding* the *prime factors* of a number is the following:

2) 36
2)18
3)9
3

Divide the given number by the smallest prime number that is contained in it without remainder; divide the quotient by the smallest prime number that is contained in it without a remainder; and so on until the quotient itself is a prime number.

The several divisors and the last quotient are the prime factors.

A number is divisible by

2 if the units' figure is 2, 4, 6, 8, 0.
3 if the sum of the digits is divisible by 3.
5 if the units' figure is 5 or 0.
9 if the sum of the digits is divisible by 9.

Which of the following numbers are divisible by 2? by 3? by 5? by 9?

24	836	516	378	1440	3060
35	225	728	800	1250	3573
63	633	189	297	6744	1620

Find the prime factors of

1. 38: 48: 49: 56: 60: 63: 68: 75: 88: 95
2. 42: 51: 54: 160: 168: 210: 112: 176: 220: 111
3. 252: 234: 225: 208: 329: 357: 208: 192: 476: 102

The factor 2 is found in 8, also in 12, therefore 2 is a common factor of 8 and 12.

The greatest factor common to both 8 and 12 is 4, therefore 4 is the greatest common factor of 8 and 12.

Find the greatest common factor of 24 and 36.

$$24=2\times2\times2\times3$$
$$36=2\times2\times3\times3$$

The common prime factors are 2, 2, and 3, whose product is 12. Thus 12 is the greatest common factor of 24 and 36.

A convenient way of *finding* the *greatest common factor* is as follows:

$$\begin{array}{r} 2\underline{)\,24-36} \\ 2\underline{)\,12-18} \\ 3\underline{)\,6-\ 9} \\ 2-\ 3 \end{array}$$

Arrange the numbers and divide by the smallest prime factor. In the illustration, the smallest prime factor is 2, and the quotients are 12 and 18. Repeat the process, dividing by 2. The quotients are 6 and 9. Divide these quotients by 3, the smallest common prime factor. The quotients, 2 and 3, have no common factor.

The *greatest common factor* (G. C. F.) of two or more numbers is the product of their common prime factors. In this example the G. C. F. is the product of 2, 2, and 3, which is 12.

EXERCISE 18.

Find the G. C. F. of

1. 24 and 48
2. 36 and 40
3. 64 and 72
4. 75 and 90
5. 48 and 128
6. 36, 40, 48, 72
7. 16, 20, 24, 40
8. 15, 35, 75, 90
9. 18, 36, 72, 90
10. 14, 28, 42, 84

The greatest common factor is often called the greatest common divisor, or the greatest common measure. Finding the G. C. F. of large numbers is of little importance.

CANCELLATION.

Cancelling or *striking out common factors* from both divisor and dividend does not change the quotient, but it shortens the work in division.

Multiply 240 by 24 and divide the product by 20.

Regular Way

$$\begin{array}{r} 240 \\ \underline{24} \\ 960 \\ \underline{480} \\ 2\cancel{0}\underline{)576\cancel{0}} \\ 288 \end{array}$$

Short Way

$$\frac{\overset{12}{\cancel{240}}\times 24}{\cancel{20}}=288$$

Cancellation is a method of work that should be employed on every possible occasion.

EXERCISE 19.

Cancellation:

1. $6\times21\times5\div7\times2$
2. $40\times24\times3\div10\times12$
3. $5\times66\times8\div4\times11$
4. $12\times6\times25\div5\times18\times10$
5. $6\times24\times54\div9\times12$
6. $7\times8\times44\div7\times11\times16$
7. $18\times30\times48\div24\times30\times36$
8. $32\times50\times72\div12\times64\times70$
9. $14\times25\times36\div12\times5\times7$
10. $28\times70\times98\div20\times14\times49$

11. Mr. Smith walks 17 miles in 5 hours. At the same rate how many miles will he walk in 20 hours? in 25 hours? in 40 hours?

12. My lot of land is $\frac{3}{7}$ as large as my neighbor's lot, which contains 17,500 square feet. How many square feet are there in my lot?

13. Mr. A. is worth $\frac{3}{5}$ as much as Mr. B. If Mr. A. is worth $6000, how much is Mr. B. worth?

LEAST COMMON MULTIPLE.

A *multiple* of a number is a number that is exactly divisible by it. 3×5=15. 15 is a multiple of both 3 and 5.

A multiple of a number is larger than the number, except when it is the number itself.

Multiples of 8 are 8, 16, *24*, 32, 40, *48*, 56, 64, *72*, etc.

Multiples of 12 are 12, *24*, 36, *48*, 60, *72*, etc.

We notice in the above multiples of 8 and 12, that 24, 48, and 72 are common to both. 24 is the smallest common multiple, and we call it the *least common multiple.*

The *least common multiple* (L. C. M.) of two or more numbers is the least number that is a multiple of each of them.

The *least common multiple* of two or more numbers is the *product* of their *prime factors,* each factor being used the greatest number of times it is found in any of the numbers.

Find the L. C. M. of 8, 12, and 20.

$$\begin{aligned} 8&=2\times2\times2\\ 12&=2\times2\times3\\ 20&=2\times2\times5 \end{aligned}$$

The greatest number of times 2 is used as a factor in any number is 3 times.

The greatest number of times 3 is used is once.

The greatest number of times 5 is used is once.

The L. C. M. of 8, 12, and 20 is 2×2×2×3×5=120.

Another method of *finding* the *L. C. M.* is to divide by any prime number that will divide one or more of the numbers.

$$\begin{array}{r|l} 2 & 8—12—20 \\ \hline 2 & 4—\ 6—10 \\ \hline 2 & 2—\ 3—\ 5 \\ \hline 3 & 1—\ 3—\ 5 \\ \hline 5 & 1—\ 1—\ 5 \\ \hline & 1—\ 1—\ 1 \end{array}$$

When one or more of the numbers are not divisible, bring them down without changing them.

Continue to divide until all the quotients are 1.

The product of all the divisors will be the L. C. M. 2×2×2×3×5=120 L. C. M.

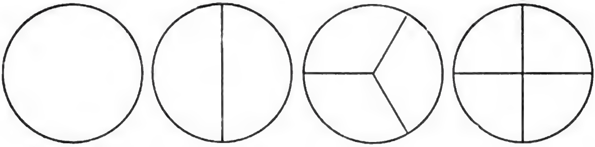
EXERCISE 20.

Find the L. C. M. of

1. 30, 45, 64
2. 36, 45, 60
3. 27, 33, 54
4. 12, 18, 96
5. 20, 27, 45
6. 14, 96, 128
7. 15, 26, 39
8. 25, 60, 180
9. 16, 42, 80
10. 42, 56, 70
11. 22, 44, 88, 108
12. 27, 32, 36, 56
13. 28, 56, 72, 96
14. 14, 42, 63, 108
15. 21, 63, 72, 99
16. 72, 80, 84, 96
17. 42, 48, 84, 126
18. 18, 20, 36, 72
19. 32, 36, 49, 56
20. 28, 72, 84, 96

The least common multiple of large numbers is of little importance, and is confusing to a child at this stage of mathematics.

FRACTIONS.



The first circle represents a unit.

The second circle is divided into two equal parts: each part is called one half (½).

The third circle is divided into three equal parts: each part is called one third (1/3); two parts are called two thirds (2/3).

The fourth circle is divided in four equal parts: each part is called one fourth (¼); two parts are called two fourths (2/4); 2/4 are the same as ½; three parts are called three fourths (¾).

Continue the work through fifths, sixths, sevenths, eighths, ninths, tenths, and twelfths.

In expressing a fraction, as ¾, the number below the line is called the *denominator;* the number above the line is called the *numerator.*

The *denominator* tells into how many parts the unit is divided,

size of the parts.

The *numerator* tells how many parts are used.

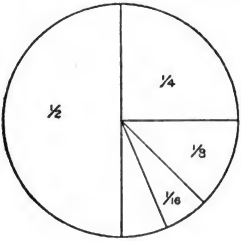
The numerator and denominator are called the *terms of a fracti*

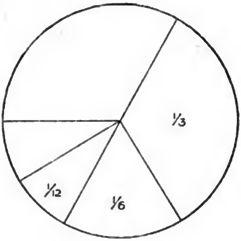
A fraction whose numerator is less than its denominator is cal

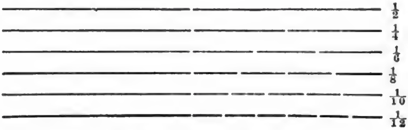
proper fraction. As ½, ¾, 5/6, 11/12.

A fraction whose numerator is greater than its denominator is called an *improper fraction,* or better, a *fractional number.* As 3/2, 7/5, 12/11.

A *mixed number* is a number consisting of an integer and a fraction. As $3\frac{1}{2}$, $7\frac{1}{8}$.







1 equals how many 4ths, 8ths, 12ths, 16ths?

½ equals how many 4ths, 8ths, 10ths?

¼ equals how many 8ths, 12ths, 16ths?

Change ¾ to 8ths.

$\frac{1}{4}=\frac{2}{8}$ $\frac{3}{4}=\frac{6}{8}$

Change $\frac{2}{3}$ to 12ths $\frac{1}{3}=\frac{4}{12}$ $\frac{2}{3}=\frac{8}{12}$

Change $\frac{3}{4}$ to 24ths $\frac{3\times6}{4\times6}=\frac{18}{24}$

To *change a given fraction* to an *equivalent fraction in larger terms,* multiply both terms of the fraction by the number which will change the denominator of the given fraction to the denominator of the required fraction.

The multiplier is found by dividing the required denominator by the given denominator.

Change

$\frac{1}{3}$ to 12ths
$\frac{5}{6}$ to 24ths
$\frac{3}{5}$ to 25ths

$\frac{7}{8}$ to 32nds
$\frac{5}{12}$ to 48ths
$\frac{5}{6}$ to 36ths

$\frac{2}{3}$ to 60ths
$\frac{3}{10}$ to 50ths
$\frac{4}{13}$ to 39ths

How many 18ths in $\frac{2}{3}$, $\frac{4}{9}$, $\frac{5}{6}$, 3, $2\frac{1}{2}$, $1\frac{2}{9}$?

How many 12ths in $\frac{1}{6}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$, 4, 8, $2\frac{1}{3}$?

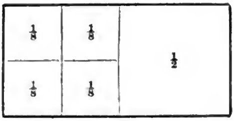
Have the child fill in the missing numerators, and prove the first four of each example by a drawing.

1. $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{}{10} = \frac{}{12}$
2. $\frac{1}{4} = \frac{}{8} = \frac{}{12} = \frac{}{16} = \frac{}{32} = \frac{}{64}$
3. $\frac{3}{5} = \frac{}{10} = \frac{}{15} = \frac{}{20} = \frac{}{25} = \frac{}{30}$
4. $\frac{2}{3} = \frac{}{6} = \frac{}{9} = \frac{}{12} = \frac{}{15} = \frac{}{18}$
5. $\frac{5}{8} = \frac{}{16} = \frac{}{24} = \frac{}{32} = \frac{}{40} = \frac{}{48}$

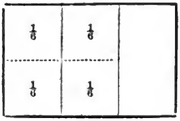
The *least common denominator* of two or more fractions is the L. C. M. of their denominators.

Change to equivalent fractions having a least common denominator.

$\frac{1}{2}, \frac{3}{4}, \frac{2}{3}$ $\frac{1}{4}, \frac{2}{5}, \frac{3}{10}$ $\frac{7}{8}, \frac{1}{6}, \frac{1}{3}$
$\frac{2}{3}, \frac{5}{8}, \frac{7}{12}$ $\frac{2}{3}, \frac{4}{5}, \frac{1}{6}$ $\frac{14}{15}, \frac{11}{20}, \frac{7}{9}, \frac{1}{6}$
$\frac{3}{8}, \frac{5}{6}, \frac{2}{9}, \frac{7}{12}$ $\frac{4}{9}, \frac{7}{12}, \frac{3}{5}$ $\frac{7}{8}, \frac{4}{15}, \frac{3}{4}, \frac{2}{3}$



$\frac{4}{8} = \frac{1}{2}$



$\frac{4}{6} = \frac{2}{3}$

To *change a given fraction* to an *equivalent fraction in smaller terms*, divide both terms of the fraction by the greatest common factor.

$\frac{4}{8} \begin{smallmatrix}\div\\ \div\end{smallmatrix} \frac{4}{4} = \frac{1}{2}$ $\frac{4}{6} \begin{smallmatrix}\div\\ \div\end{smallmatrix} \frac{2}{2} = \frac{2}{3}$

Reduce to lowest terms:

$\frac{6}{9}, \frac{4}{12}, \frac{25}{75}, \frac{9}{36}, \frac{10}{16}, \frac{12}{21}, \frac{8}{20}, \frac{25}{150}, \frac{18}{30}, \frac{48}{56}, \frac{56}{128}$

To be memorized. To multiply or divide both terms of a fraction by the same number does not change its value. Multiply when changing to higher terms; divide when changing to lower terms.

To change a mixed number to an equivalent fractional number.

$2\frac{5}{6}$ is a mixed number. First change the integer 2 to 6ths, making 12 6ths; to this add the 5 6ths, making $\frac{17}{6}$.

Change to equivalent fractional numbers:

$4\frac{3}{4}$ $16\frac{3}{4}$ $15\frac{4}{5}$ $92\frac{3}{8}$ $36\frac{3}{8}$
$12\frac{2}{3}$ $25\frac{2}{3}$ $16\frac{7}{25}$ $18\frac{3}{5}$ $55\frac{5}{7}$

To change a fractional number to an integral or mixed number, divide the numerator by the denominator.

Change to integral or mixed numbers:

$\frac{12}{6}, \frac{17}{8}, \frac{85}{7}, \frac{84}{9}, \frac{84}{12}, \frac{61}{5}, \frac{97}{11}, \frac{125}{6}$

ADDITION OF FRACTIONS.

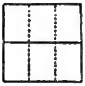
Add fractions having the same denominator by adding the numerators and placing the sum over the common denominator. Reduce the answer to its simplest form.

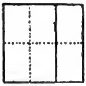
$\frac{2}{7}+\frac{4}{7}=\frac{6}{7}$ $\qquad$ $\frac{1}{5}+\frac{2}{5}+\frac{4}{5}=\frac{7}{5}=1\frac{2}{5}$

Fractions having the same denominator are called *similar fractions.*

Fractions must be made *similar* before they can be *added* or *subtracted.*

Add $\frac{1}{2}$ and $\frac{2}{3}$





To add these fractions we must make them similar by reducing them to fractions having the same denominator.

The least common denominator of 2 and 3 is 6.

$\frac{1}{2}=\frac{3}{6}$

$\frac{2}{3}=\frac{4}{6}$ Thus $\frac{1}{2}+\frac{2}{3}=\frac{3}{6}+\frac{4}{6}=\frac{7}{6}=1\frac{1}{6}$

$9\frac{3}{4}\ \frac{18}{24}$
$25\frac{7}{8}\ \frac{21}{24}$
$205\frac{2}{3}\ \frac{16}{24}$
$241\frac{7}{24}$

Add $9\frac{3}{4}$, $25\frac{7}{8}$ and $205\frac{2}{3}$. To add mixed numbers, add to the sum of the integers the sum of the fractions, and reduce to lowest terms.

First change the fractions to similar fractions having the L. C. D. 24. Adding 18, 21 and 16 24ths we have $\frac{55}{24}=2\frac{7}{24}$. Place $\frac{7}{24}$ under the fraction column and add 2 to the units.

EXERCISE 21.

1.

$\frac{3}{8}+\frac{2}{3}+\frac{1}{2}+\frac{5}{6}=$
$\frac{3}{4}+\frac{1}{4}+\frac{7}{12}+\frac{1}{2}=$
$\frac{5}{8}+\frac{7}{12}+\frac{1}{2}+\frac{2}{3}=$
$\frac{1}{2}+\frac{1}{8}+\frac{5}{6}+\frac{5}{24}=$

$+ \quad + \quad + \quad =$

2.

$\frac{2}{7}+\frac{1}{4}+\frac{3}{14}+\frac{1}{2}=$
$\frac{3}{4}+\frac{1}{2}+\frac{3}{7}+\frac{5}{28}=$
$\frac{1}{2}+\frac{1}{7}+\frac{5}{14}+\frac{3}{7}=$
$\frac{5}{7}+\frac{1}{14}+\frac{11}{28}+\frac{1}{7}=$

$+ \quad + \quad + \quad =$

3.

$\frac{1}{2}+\frac{7}{10}+\frac{2}{5}+\frac{1}{6}=$
$\frac{2}{3}+\frac{1}{5}+\frac{11}{15}+\frac{5}{6}=$
$\frac{17}{30}+\frac{1}{3}+\frac{1}{2}+\frac{4}{15}=$
$\frac{3}{10}+\frac{2}{15}+\frac{1}{5}+\frac{2}{3}=$

$+ \quad + \quad + \quad =$

4.

$\frac{3}{4}+\frac{5}{6}+\frac{1}{18}+\frac{1}{2}=$
$\frac{11}{36}+\frac{1}{9}+\frac{2}{3}+\frac{1}{4}=$
$\frac{5}{9}+\frac{7}{18}+\frac{1}{6}+\frac{5}{12}=$
$\frac{1}{3}+\frac{7}{9}+\frac{3}{4}+\frac{5}{6}=$

$+ \quad + \quad + \quad =$

5.

$\frac{1}{5}+\frac{5}{8}+\frac{3}{10}+\frac{1}{4}=$
$\frac{3}{4}+\frac{1}{2}+\frac{13}{20}+\frac{3}{5}=$
$\frac{7}{16}+\frac{3}{4}+\frac{2}{5}+\frac{1}{10}=$
$\frac{1}{4}+\frac{3}{8}+\frac{7}{10}+\frac{13}{40}=$

$+ \quad + \quad + \quad =$

6.

$\frac{1}{3}+\frac{2}{5}+\frac{3}{10}+\frac{17}{30}=$
$\frac{5}{6}+\frac{1}{2}+\frac{2}{15}+\frac{2}{3}=$
$\frac{1}{2}+\frac{7}{10}+\frac{3}{5}+\frac{1}{10}=$
$\frac{1}{10}+\frac{1}{6}+\frac{2}{3}+\frac{4}{15}=$

$+ \quad + \quad + \quad =$

SUBTRACTION OF FRACTIONS.

From $\frac{2}{3}$ take $\frac{1}{2}$
$\frac{2}{3} = \frac{4}{6}$
$\frac{1}{2} = \frac{3}{6}$
$\frac{2}{3} - \frac{1}{2} = \frac{4}{6} - \frac{3}{6} = \frac{1}{6}$

Rule for subtraction of fractions. Change both fractions to similar fractions and find the difference of the numerators. Write the result over the common denominator and reduce to simplest form.

From $25\frac{7}{8}$ take $9\frac{3}{4}$
$25\cancel{\frac{7}{8}}\ \frac{7}{8}$
$9\cancel{\frac{3}{4}}\ \frac{6}{8}$
$16\ \ \frac{1}{8}$

To subtract one mixed number from another, change the fractions to similar fractions and subtract.

From $25\frac{3}{4}$ take $9\frac{7}{8}$
$25\cancel{\frac{3}{4}}\ \frac{6}{8}$
$9\cancel{\frac{7}{8}}\ \frac{7}{8}$
$15\frac{7}{8}$

As we cannot take $\frac{7}{8}$ from $\frac{6}{8}$, we change 1 unit of the 25 to 8ths, which with $\frac{6}{8} = \frac{14}{8}$
$\frac{14}{8} - \frac{7}{8} = \frac{7}{8}$ 24 — 9 = 15.

Subtraction examples:

$\frac{1}{2} - \frac{1}{4}$	$\frac{7}{10} - \frac{3}{8}$	$15\frac{1}{2} - 12\frac{1}{3}$
$\frac{1}{4} - \frac{1}{7}$	$\frac{5}{6} - \frac{3}{7}$	$15\frac{5}{6} - 7\frac{3}{5}$
$\frac{1}{6} - \frac{1}{9}$	$\frac{1}{2} - \frac{4}{9}$	$29\frac{1}{3} - 25\frac{7}{8}$
$\frac{11}{12} - \frac{3}{4}$	$\frac{7}{8} - \frac{3}{4}$	$54\frac{2}{3} - 22\frac{5}{6}$
$\frac{17}{24} - \frac{11}{36}$	$56\frac{2}{15} - 32\frac{1}{5}$	$72 - 48\frac{5}{18}$

MULTIPLICATION OF FRACTIONS.

Review. The numerator of a fraction shows the number of parts. The denominator shows the size of each part.

To multiply ¾ by 2 we may multiply the number of parts $2 \times \frac{3}{4} = \frac{6}{4} = \frac{3}{2}$, or make each part twice as large by dividing the denominator.
$\cancel{2} \times \frac{3}{\underset{2}{\cancel{4}}} = \frac{3}{2}$

A *fraction* is *multiplied* by *multiplying the numerator,* or by *dividing the denominator.*

Multiply ⅞ by 4.

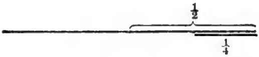
Every whole number, or integer, may be considered the numerator of a fraction whose denominator is 1. Therefore 4 may be written $\frac{4}{1}$.

$\frac{7}{8} \times 4 = \frac{7 \times \cancel{4}}{\underset{2}{\cancel{8}}} = \frac{7}{2} = 3\frac{1}{2}$. Cancel when possible.

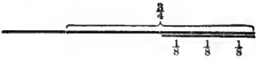
Multiply, cancelling when possible:

$\frac{3}{7} \times 4$	$27 \times \frac{2}{9}$	$\frac{4}{15} \times 5$	$11 \times \frac{8}{121}$
$\frac{4}{5} \times 2$	$36 \times \frac{11}{12}$	$\frac{3}{8} \times 6$	$8 \times \frac{9}{64}$
$\frac{3}{10} \times 5$	$124 \times \frac{3}{8}$	$\frac{11}{12} \times 10$	$12 \times \frac{31}{60}$
$\frac{5}{13} \times 4$	$54 \times \frac{15}{27}$	$\frac{24}{35} \times 21$	$36 \times \frac{13}{72}$
$\frac{7}{15} \times 6$	$45 \times \frac{8}{15}$	$\frac{45}{77} \times 22$	$16 \times \frac{15}{64}$
$\frac{5}{14} \times 7$	$16 \times \frac{3}{4}$	$\frac{73}{144} \times 12$	$120 \times \frac{13}{60}$

To multiply one fraction by another fraction.



$\frac{1}{2}$ of $\frac{1}{2} = \frac{1}{4}$ or $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$



$\frac{1}{2}$ of $\frac{3}{4} = \frac{3}{8}$ or $\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$

To multiply one fraction by another fraction, multiply the numerators together for the numerator of the product, and multiply the denominators together for the denominator of the product, and reduce to simplest form.

Multiply, cancelling when possible:

$\frac{13}{14} \times \frac{7}{11}$ $\frac{4}{5} \times \frac{5}{12}$ $\frac{8}{12} \times \frac{9}{16}$ $\frac{10}{11} \times \frac{3}{10}$
$\frac{42}{75} \times \frac{5}{21}$ $\frac{6}{9} \times \frac{7}{15}$ $\frac{11}{15} \times \frac{5}{7}$ $\frac{7}{9} \times \frac{6}{14}$
$\frac{8}{24} \times \frac{10}{14}$ $\frac{14}{21} \times \frac{7}{10}$ $\frac{5}{9} \times \frac{9}{35}$ $\frac{15}{16} \times \frac{8}{10}$

To multiply a mixed number by a mixed number.

Multiply $3\frac{3}{8}$ by $6\frac{2}{3} = \frac{\overset{9}{\cancel{27}} \times \overset{5}{\cancel{20}}}{\underset{2}{\cancel{8}} \times \cancel{3}} = \frac{45}{2} = 22\frac{1}{2}$.

To multiply a mixed number by a mixed number, change the mixed numbers to equivalent fractional numbers, and multiply as fractions.

Multiply the following mixed numbers:

$3\frac{1}{3} \times 4\frac{4}{5}$ $45\frac{1}{3} \times 28\frac{1}{2}$ $6\frac{5}{8} \times 9\frac{1}{7}$
$2\frac{4}{5} \times 3\frac{1}{7}$ $82\frac{1}{4} \times 18\frac{2}{3}$ $81\frac{1}{5} \times 23\frac{4}{7}$
$35\frac{2}{5} \times 3\frac{3}{8}$ $15\frac{5}{8} \times 15\frac{3}{5}$ $17\frac{3}{4} \times 14\frac{2}{5}$

To multiply an integer by a mixed number.

Multiply 125 by $4\frac{2}{5}$.

```
  125
   4⅖
5)250
   50
  500
  550
```

To multiply an integer by a mixed number, multiply the integer by the fractional part of the mixed number, and then by the whole part.

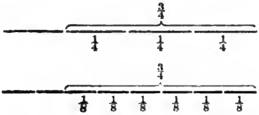
Multiply 128 by $4\frac{2}{5}$.

$\frac{128 \times 22}{5} = \frac{2816}{5} = 563\frac{1}{5}$. When the integer cannot be divided evenly by the denominator of the fractional part of the mixed number, change the mixed number to a fractional number and multiply. Multiply, using the method best adapted to the example.

$164 \times 17\frac{1}{2}$ $152 \times 24\frac{3}{4}$ $504 \times 87\frac{1}{9}$
$225 \times 2\frac{3}{5}$ $225 \times 16\frac{3}{4}$ $72 \times 52\frac{1}{8}$
$136 \times 5\frac{1}{8}$ $192 \times 204\frac{3}{8}$ $108 \times 67\frac{1}{4}$
$187 \times 16\frac{8}{11}$ $516 \times 54\frac{7}{12}$ $725 \times 90\frac{3}{5}$

DIVISION OF FRACTIONS.

1. To divide a fraction by an integer. In multiplications of fractions we learned that a fraction was multiplied by multiplying the numerator or dividing the denominator. In division of fractions the reverse is true. A fraction is divided by dividing the numerator or multiplying the denominator.



Divide $\frac{3}{4}$ by 3
$\frac{3}{4} \div 3 = \frac{1}{4}$

Divide $\frac{3}{4}$ by 2
$\frac{3}{4} \div 2 = \frac{3}{8}$

Divide the following, using the method best adapted to the example:

$\frac{4}{5} \div 4$
$\frac{7}{8} \div 2$
$\frac{3}{7} \div 5$

$\frac{16}{25} \div 8$
$\frac{2}{3} \div 7$
$\frac{3}{4} \div 4$

$3\frac{1}{4} \div 8$
$\frac{35}{62} \div 7$
$20\frac{5}{7} \div 5$

$\frac{48}{52} \div 12$
$6\frac{2}{3} \div 10$
$37\frac{1}{2} \div 15$

2. To divide an integer or a fraction by a fraction: Divide 4 by $\frac{2}{3}$. We may think of $\frac{2}{3}$ as $\frac{1}{3}$ of 2. Divide 4 by $\frac{1}{3}$ of 2. 4 divided by 2 is the same as finding $\frac{1}{2}$ of 4, but as we were to divide by only $\frac{1}{3}$ of 2, our result is only $\frac{1}{3}$ of what it should be, so we multiply by 3.

Thus we see that $4 \div \frac{2}{3}$ is the same as $\frac{\overset{2}{\cancel{4}} \times 3}{\cancel{2}} = 6$.

We have inverted our divisor and multiplied. This is the method to be used, invert the divisor and proceed as in multiplication.

Examples in division:

$\frac{6}{7} \div \frac{3}{5}$
$\frac{1}{4} \div \frac{3}{4}$
$\frac{5}{6} \div \frac{4}{5}$
$\frac{3}{4} \div \frac{3}{5}$
$\frac{7}{8} \div \frac{14}{15}$

$5\frac{5}{7} \div \frac{5}{8}$
$\frac{3}{8} \div 5\frac{1}{4}$
$7\frac{1}{3} \div 1\frac{2}{5}$
$40\frac{1}{2} \div \frac{3}{4}$
$\frac{11}{12} \div 7\frac{4}{7}$

$\frac{3}{8} \div 5\frac{1}{2}$
$7\frac{3}{16} \div \frac{5}{8}$
$\frac{8}{9} \div \frac{3}{4}$
$18\frac{3}{7} \div \frac{3}{5}$
$12\frac{2}{9} \div 7\frac{5}{12}$

$24\frac{3}{4} \div \frac{11}{12}$
$7\frac{7}{8} \div 4\frac{1}{2}$
$12\frac{1}{2} \div 6\frac{1}{4}$
$8 \div 3\frac{2}{3}$
$\frac{9}{10} \div \frac{11}{12}$

(REVIEW) EXERCISE 22.

Find the G. C. F. of:

1. 21, 35, 49 .
2. 63, 84, 105
3. 48, 60, 96, 108
4. 75, 150, 225, 250
5. 12, 18, 42, 48.

Find the L. C. M. of:

6. 14, 21, 54, 56, 84
7. 3, 15, 12, 42, 60
8. 12, 20, 30, 45
9. 5, 12, 18, 30, 60
10. 24, 36, 52, 48, 72.

Change to lowest terms:

11. $\frac{24}{56}$, $\frac{27}{45}$, $\frac{15}{18}$, $\frac{55}{121}$
12. $\frac{136}{168}$, $\frac{86}{252}$, $\frac{25}{175}$, $\frac{56}{64}$
13. $\frac{80}{120}$, $\frac{45}{180}$, $\frac{45}{135}$, $\frac{48}{288}$
14. $\frac{35}{105}$, $\frac{54}{72}$, $\frac{48}{72}$, $\frac{36}{90}$
15. $\frac{24}{96}$, $\frac{180}{234}$, $\frac{808}{606}$, $\frac{144}{192}$

Addition:

21. $\frac{3}{7}+\frac{7}{10}+\frac{1}{2}+\frac{2}{5}$
22. $12\frac{3}{4}+20\frac{7}{8}+152\frac{5}{12}$
23. $205\frac{3}{4}+56\frac{2}{5}+99\frac{5}{8}$
24. $5\frac{3}{4}+29\frac{5}{8}+1\frac{5}{64}+49$
25. $201\frac{3}{5}+52\frac{1}{3}+76\frac{8}{25}$

Multiplication:

31. $11\frac{1}{5}\times\frac{6}{7}$
32. $\frac{9}{12}\times\frac{6}{7}\times\frac{14}{15}$
33. $\frac{7}{15}\times\frac{4}{27}\times\frac{11}{14}\times3\frac{1}{3}\times4\frac{2}{7}$
34. $\frac{9}{10}\times\frac{5}{8}\times\frac{4}{7}\times15\frac{3}{4}$
35. $\frac{10}{27}\times\frac{18}{25}\times3\frac{5}{7}\times10\frac{10}{13}$

Change to other forms:

16. $69\frac{5}{6}$, $\frac{586}{12}$, $\frac{4096}{16}$
17. $57\frac{7}{9}$, $607\frac{7}{8}$, $48\frac{3}{4}$
18. $24\frac{5}{12}$, $66\frac{2}{3}$, $\frac{675}{25}$
19. $362\frac{1}{4}$, $\frac{286}{16}$, $\frac{8460}{72}$
20. $\frac{236}{6}$, $\frac{1188}{27}$

Subtraction:

26. $78\frac{3}{4}-27\frac{13}{28}$
27. $24\frac{2}{3}-5\frac{5}{6}$
28. $18\frac{1}{5}-12\frac{8}{9}$
29. $28\frac{1}{2}-12\frac{9}{10}$
30. $72-15\frac{1}{3}$

Division:

36. $17\frac{1}{2}\div2\frac{1}{4}$
37. $45\frac{5}{9}\div3\frac{1}{27}$
38. $\frac{7}{12}$ of $2\frac{5}{8}\div\frac{5}{8}$ of $8\frac{3}{4}$
39. $7\frac{1}{5}\div\frac{6}{7}$
40. $13\frac{4}{7}\div25$

TABLES OF MEASURE.

LENGTH OR DISTANCE.

12 inches (in. or ″) = 1 foot (ft. or ′)
3 feet = 1 yard (yd.)
5½ yd. or 16½ ft. = 1 rod (rd.)
320 rods } = 1 statute mile (mi.)
5280 feet } = 1 statute mile (mi.)

4 inches = 1 hand
6 feet = 1 fathom
1.15 common miles = 1 nautical mile, 1 geographical mile
3 knots = 1 league
1 league = 3 geographical miles

SURFACE.

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet = 1 square yard (sq. yd.)
30¼ square yards or 272¼ square feet = 1 square rod (sq. rd.)
160 square rods = 1 acre (A.)
640 acres = 1 square mile (sq. mi.)
1 square mile = 1 section
36 square miles = 1 township
100 square feet = 1 square of flooring, shingles, slating, or roofing.

A *surface* has two dimensions, length and breadth.

A *rectangle* is a plane surface bounded by four straight lines, and having all its angles right angles.

A *square* is a rectangle all of whose sides are equal.

The *area* of a surface is the number of square units it contains.

Find the area of a rectangle 3 feet long and 2 feet wide.

1 sq. ft.	1 sq. ft.	1 sq. ft.
1 sq. ft.	1 sq. ft.	1 sq. ft.

Since there are 3 sq. ft. in 1 row, in 2 rows there will be 2 × 3 sq. ft. or 6 sq. ft.

Rule for area.

To find the area of a rectangle, multiply the number of square units in one row by the number of rows; or, multiply the units in length by the units in breadth, remembering that the units must be of the same denomination. Inches cannot be multiplied by feet, nor feet by yards.

If the units are different, one must be changed to an equivalent form of the denomination of the other.

EXERCISE 23.

1. A floor measures 18 ft. by 15 ft. How many square feet does it contain? How many square yards?

$$\begin{array}{r} 18 \\ \underline{15} \\ 90 \\ \underline{18} \\ 270 \text{ sq. ft.} \end{array} \qquad 270 \div 9 = 30 \text{ sq. yd.}$$

2. A floor measures 24 ft. by 18 ft. How many square yards does it contain?

3. How many square rods in a tract of land 120 rd. long and 40 rd. wide? Find its value at $75 per acre.

4. What is the cost of concreting a walk 25½ ft. long and 5 ft. wide at 70c per square yard?

5. How many acres are there in a rectangular field 162 rd. long and 84 rd. wide?

6. How many paving blocks will be needed to pave a street 1750 ft. long and 40 ft. wide, if it takes 48 blocks to pave a square yard?

7. A swimming tank is 38 ft. long and 18 ft. wide. What will it cost to cement the bottom at $2.35 per square yard?

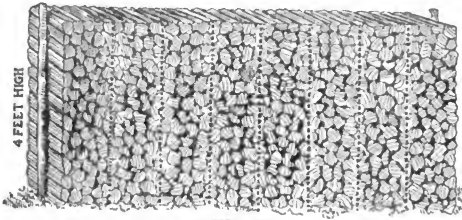
8. Compare a field 46 rd. long and 38 rd. wide with a 10 acre lot. Which is larger, and how much larger?

VOLUME.

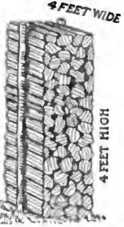
1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)
27 cubic feet = 1 cubic yard (cu. yd.)
128 cubic feet = 1 cord (cd.)
16 cubic feet = 1 cord foot (cd. ft.)
8 cord feet = 1 cord (cd.)

A cord of wood is a pile of wood 8 ft. long, 4 ft. wide, and 4 ft. high.

A CORD OF WOOD



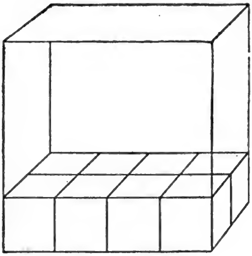
1 CORD FOOT



A *rectangular solid* is a solid bounded by six rectangles. The rectangles are called the *faces* of the solid.

A *cube* is a rectangular solid bounded by six equal faces (squares).

The *volume* of a solid is its contents reckoned in cubic units.



How many cubic feet are there in a rectangular solid 4 ft. long, 2 ft. wide and 4 ft. high?

Multiply the number of cu. ft. in 1 row by the number of rows, to find the number of cubic feet in 1 layer.

Multiply the number of cu. ft. in 1 layer by the number of layers. This gives the number of cu. ft. in the solid.

4 cu. ft. in 1 row.
2
—
8 cu. ft. in the 2 rows (the bottom layer).

8 cu. ft.
4 (number of layers).
—
32 cu. ft. in the solid.

Rule for volume.

To find the volume of a rectangular solid, multiply the area of the base by the height.

EXERCISE 24.

1. How many cubic feet of earth will be removed in digging a cellar 18 ft. by 12 ft. by 8 ft.?

2. What will it cost at 65c a cubic yard?

3. The dimensions of a room are 15 ft., 14 ft. and 9 ft. How many square feet of floor? Of walls? Of ceiling? How many cubic feet of volume?

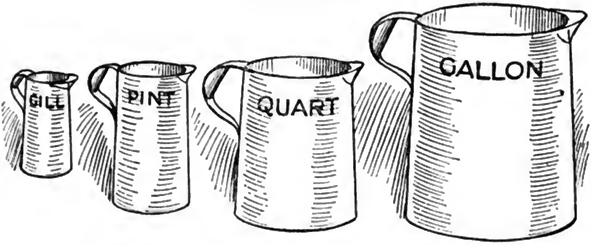
COUNTING.

12 things = 1 dozen (doz.)
12 dozen = 1 gross (gr.)
12 gross = 1 great gross.
20 things = 1 score.

Paper Table.

24 sheets = 1 quire.
20 quires or 480 sheets = 1 ream.
2 reams = 1 bundle.

CAPACITY.

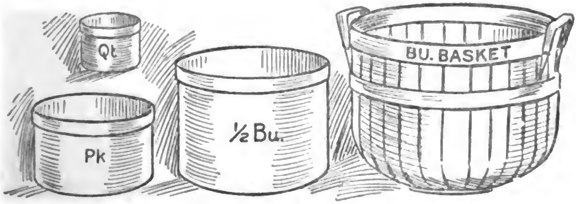


Liquid Measure.

4 gills = 1 pint (pt.)
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)
1 gallon = 231 cubic inches.

Dry Measure.

2 pints (pt.) = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)
10 pecks, 2½ bushels = 1 barrel, (bbl.)
1 bushel = 2150.42 cu. in.



Time.

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day (da.)
7 days = 1 week (wk.)
365 days = 1 common year (yr.)
366 days = 1 leap year.
12 months (mo.) = 1 year.
100 years = 1 century

Weight (Avoirdupois).

16 ounces (oz.) = 1 pound (lb.)
100 pounds = 1 hundredweight (cwt.)
2000 pounds = 1 ton (T.)
2240 pounds = 1 long ton (L. T.)
60 pounds = 1 bushel wheat or potatoes.
196 pounds = 1 barrel flour.
200 pounds = 1 barrel pork or beef.

Circular.

60 seconds (″) = 1 minute (′)
60 minutes = 1 degree (°)
360 degrees = 1 circumference.

EXERCISE 25.

The following problems will help fix the tables in the mind. In performing a problem imagine yourself to be one of the parties in every transaction.

1. Change 26 quarts to bushels and pecks. Find the number of quarts in 3 bu., 3 pk., 3 qt.

2. Reduce 3 acres to square feet.

3. How many reams of paper are there in 6720 sheets?

4. Change 62,208 cu. in. to cu. yd.

5. A man bought 5 acres of land at $172 per acre, and sold it at 23c per sq. ft. What was his gain?

6. What must be paid for a pile of wood 25 ft. long, 4 ft. high, and 4 ft. wide, at $5.75 per cord?

7. Find the entire surface of a block of marble 10 ft. long, 2½ ft. wide, and 1½ ft. thick.

8. What will 5 bu. 3 pk. of potatoes cost at $1.15 per bushel?

9. How many gallons of water are there in a tank 3 ft. square, if the water is 4 ft. 4 in. deep?

10. A man paid $385 for 77 cords of wood. He sold the following lots: 12½ cd., 18 cd., and 14¾ cd., all at $5.25 per cd. What did he gain on what he sold?

PRACTICAL APPLICATION OF SURFACE MEASURE.

BOARD MEASURE.

A board foot is the unit of measure for boards, planks, timbers, and joists.

A *board foot* is 1 foot long, 1 foot wide, and 1 inch thick. Lumber less than 1 inch thick is considered 1 inch thick in measuring.

To *find* the *number of feet of lumber* or any timber, find the area of one face in square feet and multiply by the thickness in inches.

EXERCISE 26.

Find the board feet in the following:

1. A board 21 ft. long, 8 in. wide, $\frac{7}{8}$ in. thick.
2. A board 18 ft. long, 12 in. wide, 1 in. thick.
3. 8 joists, each 3 in. by 4 in. and 15 ft. long.
4. 5 2-in. planks, each 12 ft. long, 10 in. wide.
5. 8 boards each 15 ft. long, 9 in. wide, $1\frac{1}{2}$ in. thick.

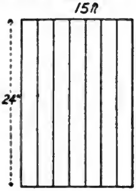
CARPETING.

In *determining* the number of *yards of carpet* that must be bought to carpet a floor, divide the width of the room by the width of the carpet, to find the number of breadths.

A fractional part of a breadth should be regarded as a full breadth.

Multiply the length of each breadth by the number of breadths.

What is the cost of carpeting a room 24 ft. long, 15 ft. wide, with carpet $\frac{3}{4}$ yd. wide, at $1.15 per yard, the breadths to be laid lengthwise?



$15 \text{ ft.} \div 2\frac{1}{4} \text{ ft.} \div 6\frac{2}{3} = 7$ breadths

$24 \text{ ft.} \times 7 = 168 \text{ ft.} = 56$ yds.

$\$1.15 \times 56 = \$64.40.$

EXERCISE 27.

1. Find the cost of carpeting a floor 24 ft. long and 18 ft. wide, with carpet $\frac{3}{4}$ yard wide, at 95c per yard, breadths to be laid lengthwise.

2. How much will it cost to carpet a room 15 ft. by 12 ft. with carpet ¾ yard wide at $1.20 a yard, if the breadths run lengthwise?

3. A room 24 ft. by 20 ft. is to be carpeted with carpet 1 yd. wide at 85c per yard. Which will be cheaper, to lay the breadths lengthwise or crosswise?

PAPERING.

Wall papers are usually ½ yard wide and 8 yd. long for a single roll, 16 yd. for a double roll.

The usual way of *reckoning* the *number of rolls* required to cover the walls is:

1. Measure the distance around the room.

2. Deduct the width of doors and windows.

3. Divide the difference by the width of the paper to find the number of strips.

4. Divide the length of a roll by the height of the wall to find the number of strips in a roll.

5. Divide the strips required for the room by the strips in a roll.

This gives the number of rolls required.

What will it cost to paper the walls of a room 16 ft. long, 15 ft. wide and 9 ft. high at 45c a roll? There are 2 doors 3½ ft. wide and 3 windows 3 ft. wide.

2(16 ft. + 15 ft.) = 62 ft. distance around the room.

7 ft. + 9 ft. = 16 ft. width of doors and windows.

62 ft. — 16 ft. = 46 ft.

46 ft. ÷ $1\frac{1}{2}$ ft. ($\frac{1}{2}$ yd.) = $30\frac{2}{3}$ or 31 strips.

16 yd. or 48 ft. ÷ 9 ft. (height of room) = 5+. We see there can be but 5 strips in a double roll.

31 ÷ 5 = $6\frac{1}{5}$ double rolls, which would be equivalent to 13 single rolls.

13 × .45 = $5.85 cost of paper.

PLASTERING.

To estimate the cost of plastering a room, find the total area of walls and ceiling. Take from this ½ of the surface of doors and windows.

Multiply by the price per sq. yd.

EXERCISE 28.

1. What will be the cost of plastering a room 14 ft. long, 12 ft. wide, 9 ft. high, at 35c per sq. yd.? There are 2 doors 7 ft. by 3½ ft., and 2 windows 6 ft. by 3 ft.

2. Find the cost of plastering a room 24 ft. by 18 ft. by 10 ft., at 30c per sq. yd. There are 2 doors 7 ft. by 3 ft., and 3 windows 6 ft. by 3½ ft.

LATHS AND SHINGLES.

Laths are 4 ft. long, 1½ in. wide, and are usually put up in bundles of 100 each.

Allowing for waste, a bundle of laths will cover 6 sq. yd.

Lathing is estimated by the sq. yd. ½ of the area of all openings is deducted.

Shingles are sold in bunches of 250 each. Dealers will not sell part of a bunch.

Four bunches, or 1,000 shingles, laid 4 inches to the weather, will cover 100 square feet.

EXERCISE 29.

1. How many bundles of laths will be required for the ceiling of a room 18 ft. long and 15 ft. wide?

2. What is the cost of lathing a room 15 ft. long, 12 ft. wide, and 9 ft. high? There are two doors 6½ ft. by 3½ ft., and two windows 6 ft. by 3½ ft.

The laths cost 40c a bundle, and the workman charges 20c a bundle for his labor.

3. How many shingles will be required to shingle the roof of a house 38 ft. long, if the rafters are 22 ft. long?

$2(38 \times 22) = 1672$ sq. ft.

1672 sq. ft. $\div 100 = 16.72$ squares.

16.72 squares will require 16¾ M. or 67 bunches of shingles.

EXERCISE 30.

1. I bought 180 bbl. of flour at $5.60 per bbl., and sold the whole for $1,297. How much did I gain?

2. I bought a farm of 135 acres at $46.50 per acre, and sold the farm for $8,575. What did I gain or lose?

3. A farmer bought 24 head of young cattle for $372. He kept them for 4 mo. at an expense of $2.50 a head per month, and sold them at $31.50 each. How much did he gain?

4. A merchant bought 750 bu. of potatoes at 48c per bushel. Allowing 2½ bu. for waste, how much will he gain by retailing the rest at 18c a peck?

5. A farmer has 32 apple trees which bear on an average 5 bbl. each. He hires 3 men for a week at $1.50 per day. He pays 25c each for the barrels, and 10c a barrel for transportation. He sells them for $3.25 a bbl. How much does he make?

6. A lumber dealer bought 45,500 ft. of lumber at $22.50 per M. He sold 26,000 ft. at $31.50 per M., and the remainder at $27.50 per M. How much did he gain?

TIME SHEETS.

Pay rolls are made out from time sheets.

Eight hours are usually reckoned as a day.

Copy the following time sheets, and compute the amount due each workman, also the total wages for the week.

How much did each man lose by failing to work full time?

CARPENTER'S TIME SHEET.

	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Hours	Days	Wages per day	Amount
James Richards	8	7½	7½	8	8	4			$3.60	$
Fred Hall	7¾	8	7½	7¾	8	3½			$3.50	$
William Holmes	8	8	8	8	8	4			$3.25	$
George Smith .	8	8	7¾	8	7½	3¾			$3.25	$
Arthur Dodge .	7½	7	8	8	7½	4			$3.20	$
William Jackson	8	7	7½	7¾	7¾	4			$3.00	$
John Woods ..	8	7½	8	8	8	3½			$2.90	$
Total										$

CONTRACTOR'S TIME SHEET.

	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Total Hours	Days	Wages per day	Amount
Joseph Dunn .	8	8	8	8	8	4			$3.50	$
Thomas Hunt .	8	7¾	7¾	8	7½	4			$3.25	$
Sam Wilson ..	8	8	8	8	7½	3½			$3.20	$
Frank Albee ..	8	7½	8	7½	8	4			$3.00	$
Henry Towne .	8	8	7½	7¾	8	3¾			$3.00	$
Sidney Brown	8	8	7¾	7¾	8	3½			$2.50	$
Total.....										$

In the following time sheet, call 10 hours a day's work.

MANUFACTURER'S TIME SHEET.

	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Total Hours	Days	Wages per day	Amount
John Moore . . .	10	10	10	10	10	5			$3.00	$
Henry Walker .	9	9½	9¾	9¾	9½	4½			$3.00	$
Benj. Drew . . .	8½	9	9½	9¾	9¼	4¼			$3.00	$
Fred Norris . . .	9½	9¾	10	9	9¾	4½			$3.00	$
Frank Prescott	10	10	10	10	10	5			$3.00	$
James Bennett	10	10	10	10	10	5			$3.00	$
Total. . . .										$

PERCENTAGE.

Percentage is simply an application of decimal fractions.

Per cent means *hundredths.*

Six per cent means six hundredths, $\frac{6}{100}$ or .06.

The *symbol* or *sign* of per cent is %.

Thus, six per cent is written 6%.

100% of a number is the number itself.
75% of a number is $\frac{75}{100}$ or ¾ of the number.
50% of a number is $\frac{50}{100}$ or ½ of the number.
25% of a number is $\frac{25}{100}$ or ¼ of the number.

Any per cent of a number may be expressed as a common fraction by writing the per cent as the numerator, and 100 for the denominator. Reduce the fraction to lowest terms.

The following table illustrates the close relationship between percentage and common fractions:

Percent		Decimal		Common Fraction		
100%	=	1.0	=	$\frac{100}{100}$	=	1
75%	=	.75	=	$\frac{75}{100}$	=	$\frac{3}{4}$
50%	=	.50	=	$\frac{50}{100}$	=	$\frac{1}{2}$
25%	=	.25	=	$\frac{25}{100}$	=	$\frac{1}{4}$
10%	=	.10	=	$\frac{10}{100}$	=	$\frac{1}{10}$
9%	=	.09	=	$\frac{9}{100}$		
4%	=	.04	=	$\frac{4}{100}$	=	$\frac{1}{25}$
1%	=	.01	=	$\frac{1}{100}$		
½%	=	.005	=	$\frac{5}{1000}$	=	$\frac{1}{200}$
¼%	=	.0025	=	$\frac{25}{10000}$	=	$\frac{1}{400}$
125%	=	1.25	=	$\frac{125}{100}$	=	$1\frac{1}{4}$
160%	=	1.60	=	$\frac{160}{100}$	=	$1\frac{3}{5}$

Finding ¾ of a number is the same as finding 75% of that number.

180 ÷ ¾ of some number; or 180 = 75% of some number. A good knowledge of fractions makes percentage easy. Express as common fractions in lowest terms: 4%, $33\frac{1}{3}$%, 175%, ¾%.

$4\% = \frac{4}{100} = \frac{1}{25}$, $33\frac{1}{3}\% = \frac{33\frac{1}{3}}{100} = \frac{1}{3}$, $175\% = \frac{175}{100} = \frac{7}{4}$, $\frac{3}{4}\% = \frac{75}{10000} = \frac{3}{400}$.

Express each of the following as a decimal, and as a common fraction in its lowest terms:

20%
25%
12%
30%

75%
15%
80%
$16\frac{2}{3}$%

125%
37½%
87½%
¾%

60%
½%
137½%
62½%

9%
6¼%
$11\frac{1}{9}$%
24%

We may express a common fraction as a per cent by reducing the common fraction to a decimal and expressing the decimal as hundredths.

Express as per cents: $\frac{1}{16}$, $\frac{7}{12}$, $\frac{1}{125}$.

```
   .06¼              .58⅓                .008
16)1.00 = 6¼%    12)7.00 = 58⅓%    125)1.000  = ⅘%
    96               60                 1000
    --               --                 ----
     4              100
                     96
                     --
                      4
```

Express decimally as hundredths, and then as per cents:

$\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{9}$, $\frac{1}{10}$, $\frac{1}{12}$

The following per cents with their fractional equivalents are so frequently used that they should be committed to memory:

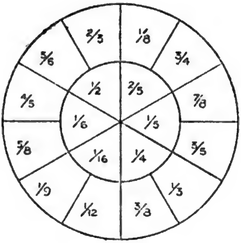
$6\frac{1}{4}\% = \frac{1}{16}$
$8\frac{1}{3}\% = \frac{1}{12}$
$10\ \% = \frac{1}{10}$
$12\frac{1}{2}\% = \frac{1}{8}$
$16\frac{2}{3}\% = \frac{1}{6}$

$20\ \% = \frac{1}{5}$
$25\ \% = \frac{1}{4}$
$30\ \% = \frac{3}{10}$
$33\frac{1}{3}\% = \frac{1}{3}$
$37\frac{1}{2}\% = \frac{3}{8}$

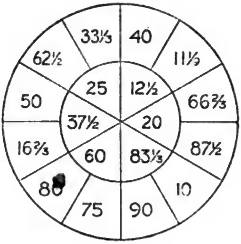
$40\ \% = \frac{2}{5}$
$50\ \% = \frac{1}{2}$
$60\ \% = \frac{3}{5}$
$62\frac{1}{2}\% = \frac{5}{8}$
$66\frac{2}{3}\% = \frac{2}{3}$

$70\ \% = \frac{7}{10}$
$75\ \% = \frac{3}{4}$
$80\ \% = \frac{4}{5}$
$87\frac{1}{2}\% = \frac{7}{8}$
$90\ \% = \frac{9}{10}$

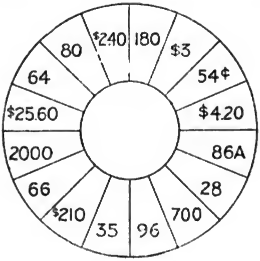
State rapidly the decimal equivalents:



State rapidly the fractional equivalents of the following %'s:



Place in center circle any per cent, as 12½, 33⅓, 20, etc.



Have pupils perform work mentally when possible, and be ready with answers in a limited time.

Repetition in this work will assure accuracy and great speed.

The examples in percentage may be classified under one of the three following principles:

I. To find a given per cent of a number.

II. To find what per cent one number is of another.

III. To find a number when a percentage of it is given.

1. To find a given per cent of a number.

A. Find 16% of $1250.

$$\begin{array}{r} \$1250. \\ .16 \\ \hline 7500 \\ 1250 \\ \hline \$200.00 \end{array}$$

B. Find 75% of $1600.

$$\frac{\$1600 \times 3}{4} = \$1200.$$

Rule. To find a per cent of a given number, multiply the given number by the rate per cent expressed either decimally or as a common fraction. Always use the shorter method.

EXERCISE 31.

1. Find 24% of $2846.
2. Find 35% of $4850.
3. Find 60% of $1500.
4. Find 420% of $6480.
5. Find 33⅓% of $1866.
6. Find 200 % of $854.50.
7. Find 0.25 % of $4000.
8. Find 0.33⅓% of $9612.

9. A farmer having 450 sheep lost 8%. How many had he left?

A.

$$\begin{array}{rl} 450 & = \text{no. of sheep} \\ .08 & \\ \hline 36.00 & = \text{no. lost} \\ 414 & = \text{no. left} \end{array}$$

B.

$$\begin{array}{rl} 450 & = \text{no. of sheep} \\ .92 & \\ \hline 900 & \\ 4050 & \\ \hline 414.00 & = \text{no. left} \end{array}$$

Method B is preferable. If he loses 8% of his sheep, he must have 92% left.

Much drill is desirable along this line that the pupil may at once recognize the per cent to be used as a multiplier.

10. A school numbers 580 children; 45% are boys. How many girls are there?

11. A man's income is $1850 a year. He spends 82% of it. How much does he save?

12. A farmer raised 3840 bu. of grain, and sold 68% of it. How much did he sell?

13. I had $2480 and spent 24% of it. How much had I left?

14. A house was bought for $6440, and sold at a gain of 22%. What was the selling price?

A.

```
 $6440 = cost.
   .22
 -------
  12880
 12880
 -------
$1416.80 = gain
$6440.
 -------
$7856.80 = selling price.
```

Method B is preferable.

B.

```
 $6440 = cost
  1.22
 -------
  12880
 12880
 6440
 -------
$7856.80 = selling price.
```

Whenever a sale is made at profit, add the per cent gained to 100 per cent before multiplying. Whenever a sale is made at a loss, subtract the per cent lost from 100 per cent before multiplying.

16. A coal dealer buys coal at $4.35 and sell it at a gain of 16%. What is his selling price?

17. A carriage costing $230 was sold at a profit of 37½%. What was the selling price?

18. A man whose salary is $3800 pays 11½% for board and 18½% for other expenses. How much does he save?

19. What is ¾% of $828? What is 1¾% of $828?

20. A man buys 48 yd. silk at $1.25 per yard, 36 yd. muslin at 12½c per yard. He pays 72% of the bill. How much does he still owe?

II. To find what per cent one number is of another.

If a pupil is absent from school 12 days in a period of 75 days, what per cent of the time is he absent?

12 da. out of 75 da. will be $\frac{12}{75}$ of the time. $\frac{12}{75} = \frac{4}{25} = .16 = 16\%$.

What per cent of 45 is 15?

A. $\frac{15}{45} = \frac{1}{3}$
$\frac{1}{3} = 33\frac{1}{3}\%$

B.

```
      .33⅓
  45)15.00
     135
     ---
      150
      135
      ---
       15
```

$33\frac{1}{3}\%$

Rule. To find what per cent one number is of another, we first express the relation as a common fraction in its lowest terms, then change the fractional part to hundredths.

What part of 60 is 20? ⅓.

What per cent of 60 is 20? 33⅓%.

EXERCISE 32

1. What per cent of 325 is 25?

2. What per cent of 175 is 125?

3. A lot of land costing $1620 was sold for $1863. What was the gain per cent?

4. I bought a farm for $5500, and paid $1200 for repairs. I sold the farm for $7839. What per cent did I gain?

5. An agent received $1360 for collecting a bill of $8500. What was the rate per cent?

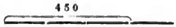
III. To find a number when a percentage of it is given.
$450 is 75% of what sum?

A.
$$.75_{\wedge}\overline{)450.00_{\wedge}}\quad 600.$$
$$\begin{array}{r} 450 \\ \hline 00 \end{array}$$

or

$450 = 75\%$
$1\% = \frac{1}{75}$ of 450
$100\% = 100 \times \frac{1}{75}$ of 450
$$\frac{\overset{6}{\cancel{450}} \times 100}{\cancel{75}} = 600$$

B.
$75\% = \frac{3}{4}$
$450 = \frac{3}{4}$



$\frac{1}{4} = \frac{1}{3}$ of $450 = 150$
$\frac{4}{4} = 4 \times 150 = 600$

or

$$\frac{\overset{150}{\cancel{450}} \times 4}{\cancel{3}} = 600$$

Rule. To find a number when a percentage of it is given, divide the given percentage by the rate per cent, expressed either as a decimal or as a common fraction.

EXERCISE 33.

1. 675 T. is 60% of how many tons?

2. 118 bu. is 25% of how many bushels?

3. $75 is ½% of what number of dollars?
   If 75 = ½%, 150 = 1%.
   100%, or the whole, = 150 × 100 = $15000.

4 $75 is 16⅔% less than what amount?
   16⅔% less = 83⅓%.
   $75 is 83⅓% of what amount?
   Or $75 = ⅚ of what amount?

5. 1860 yd. are 50% more than what amount of yards?
   50% more = 150%.
   1860 = 150% of what number?

```
              1240.
1.50∧)1860.00∧
        150
        ———
         360
         300
         ———
          600
          600
          ———
            0
```

or $1860 = \frac{3}{2}$

$$\frac{\overset{620}{\cancel{1860}} \times 2}{\cancel{3}} = 1240.$$

6. The population of a certain town is 6270, which is $37\frac{1}{2}\%$ more than it was at the last census. What was it then?

7. $12\frac{1}{2}\%$ of 6440 tons is 25% of what number of tons?

8. In 1910 a tea merchant bought 6480 chests of tea, which were 10% less than he bought in 1911. How many chests did he buy in 1911?

9. 3% of 1200 is $\frac{2}{3}\%$ of what number?

10. There leaked out of a cask 10.08 gal., which was 16% of what it first contained. What did it first contain?

Profit and Loss, Insurance, Trade Discount, Commission, Taxes, and Duties are applications of Percentage, and are reckoned by the rules that govern the three principles in Percentage.

EXERCISE 34.

PROFIT AND LOSS.

1. A house that cost $8575 was sold at a gain of 18%. What was received for it?

2. A farmer sold a lot of wheat at a profit of $12\frac{1}{2}\%$, and gained $606.25. What was the cost?

3. A merchant buys butter at 27c a pound and sells it for 36c a pound. What % does he make?

4. A real estate dealer bought 75 A. of land at $25 per acre, and sold the entire lot for $2960.80. What was the gain per cent?

5. A grocer sold 220 bbl. of apples for $467.28. If he paid $1.45 per bbl. for the apples, and 35c a bbl. for transportation, what % did he gain?

6. A dealer bought paper at $2.25 per ream, and sold it at 20c per quire. What % did he gain?

7. An estate was sold for $11,220, at a loss of 12%. What was the cost?

Find the net price of an article listed at $18.75 if the discounts are 20% and 10%.

List price	$18.75	The first discount is 20% of 18.75 = 3.75.
Less 20%	3.75	
Remainder	15.00	
Less 10%	1.50	The second discount is 10% of 15.00 = 1.50.
Net price	13.50	

EXERCISE 36.

1. A dealer sold a piano listed at $500, allowing 30% and 10% off. How much did he receive?

2. Find the net amount of a bill for $375, subject to discounts of 25% and 10%.

3. An agent buys a machine for $150 at a discount of 30% and 12½%. He sells it an advance of 5% on the list price. What is his profit?

4. What is the net cost of a bath-tub listed at $150, and sold at a discount of 40% and 10%?

5. The list price of a lot of goods amounts to $575. They are bought subject to the following discounts, 30% 10%, and 5%. What is the net sum paid?

COMMISSION.

Commission or *brokerage* is the amount paid to an agent for the transaction of business.

The *agent* is called a broker, collector, or commission merchant.

The *net proceeds* is the money left after the commission and other charges are paid.

A book agent receives a commission of 10%. What would be his commission on the sale of a set of encyclopedias for $65? What would be the net proceeds?

$65
.10
$6.50 = commission of agent.
$65 — $6.50 = $58.50, net proceeds.

A real estate agent sold a house for $8500 and charged $255 for his commission. What per cent did he charge?

.03
8500)255.00
255.00

Divide the commission by the selling price to find the per cent charged.

I send to a broker \$765.51 for the purchase of wool after the commission of 2% is deducted. What is his commission?

$$\$765.51 = \overset{100\%}{\text{sum invested}} + \overset{2\%}{\text{commisison}}$$

$$\$765.51 = 102\%$$

A. $$\frac{765.51 \times 100}{102} = \$750.50 = \text{sum invested}$$

$$\begin{array}{rl} & 750.50 = \text{sum invested} \\ \text{or B.}\ 1.02_\wedge \overline{)765.51_\wedge 00} & \\ 714 & \\ \hline 515 & \\ 510 & \\ \hline 510 & \\ 510 & \\ \hline 0 & \end{array}$$

\$765.51 — \$750.50 = \$15.01 commission

EXERCISE 37.

1. A lawyer collected 85% of an account of \$590, charging 5% commission. What was his commission?

2. Find the weekly income of a commercial traveler who receives \$10 a week and a commission of 3% of his sales, if his sales average \$450 a week.

3. A broker sells 250 bales of cotton of 500 lb. each, at 14c per pound. The rate of commission is 3%. Freight and other expenses are \$200. Find the broker's commission, and the net proceeds of the sale.

4. A commission merchant sold 500 bbl. of flour at \$7 a barrel, and sent me a check for \$3360. What rate of commission did he charge?

5. What is the per cent of commission when an agent reserves for himself \$200 of \$6200 sent him to invest?

TAXES.

A *tax* is a sum of money assessed on a person, on property, or on the income of an individual, to defray the expenses of a town, city, county or state.

A *poll tax* is a tax assessed upon a person.

A *property tax* is a tax assessed upon property.

An *income tax* is a tax assessed upon a person's income.

Property is of two kinds:

1. Real estate consists of immovable property, as land, houses, etc.
2. Personal property consists of movable property, as money, bonds, merchandise, horses, etc.

Assessors are persons authorized to make a list of all taxable property together with its estimated value.

The estimated value is called the *assessed value,* and every property owner pays a tax on the assessed value of his property.

The *rate of taxation* varies in different communities, and from year to year, as it is regulated by the amount of taxable property and the amount of money which the community needs to meet its expenses.

The assessors determine the rate of taxation yearly by dividing the amount of money to be raised (after deducting the amount of poll taxes) by the total value of property.

A tax rate of 1¾% means $17.50 on a thousand dollars, and is so stated on the tax bill.

The *collector* is the one appointed to collect the taxes, and he gives the money to the *treasurer.*

The total valuation of a town is $825,575, and the tax levy is $17,061.50. There are 275 poll taxes at $2.00 each. What is Mr. Grover's tax on property assessed at $8200?

$2.00
275
$550. = poll tax
.02
825,575)16,511.50
16,511.50
Rate = 2% or $2.00 on a thousand

$17,061.50 whole tax
$ 550.
$16,511.50 property tax
$ 8200 Mr. Grover's property
.02
$164.00 Mr. Grover's property tax
$ 2.00 Mr. Grover's poll tax
$166.00 Mr. Grover's whole tax

EXERCISE 38.

1. The valuation of property in a certain town is $985,500. The tax to be raised on the property is $16,753.50. What must be the rate? How much on a thousand?

2. What is the amount of Mr. Moore's tax if he owns $9300 worth of property, and pays a poll tax of $2.00?

3. Mr. Ames owns property valued at $12,560 in a town whose valuation is $865,000. What will be his share of a tax of $15,570?

CUSTOMS AND DUTIES.

Customs or *duties* are taxes levied by the government on imported goods.

Certain goods are on the *free list;* that is, they are admitted without duty.

Duties are reckoned:

1. At a certain per cent on the value of the goods, called *ad valorem duties.*
2. At a certain amount per pound, yard, etc., called *specific duties.*

Certain goods are subject to both ad valorem and specific duties. Government determines by an Act of Congress the duties to be paid.

INTEREST.

Charles Adams borrowed $2500 for a year, and used it in his business. At the end of the year he paid back the money, and also paid 6 per cent of the money borrowed. How much did he pay for its use?

Henry James secured a loan from the bank of $12,000 with which to buy a tract of land. The bank agreed to loan the $12,000, on condition that Mr. James would pay the bank each year a sum of money equal to 5% of the loan. How much did Mr. James pay each year?

Money paid for the use of money is called *interest.*

The sum for which interest is paid is called the *principal.*

The sum of the principal and the interest is the *amount.*

Interest is reckoned at a certain per cent of the sum borrowed.

Interest at 6% means 6c on each dollar for 1 year.

The per cent of interest is called the *rate of interest.*

The rate of interest varies, generally from 2% to 6%.

Savings banks pay 3% or 4%. Good securities demand a low rate of interest.

George H. Brown borrows $600 of John A. Briggs and agrees to pay interest at 5%. Mr. Brown should give Mr. Briggs a written promise to pay the money.

This written promise is called a *promissory note.*

A PROMISSORY NOTE.

$600. Boston, Feb. 1, 1911.

On demand I promise to pay to the order of

John A. Briggs

Six hundred Dollars

with interest at 5%.

Value received.

GEORGE H. BROWN.

$600, or the sum of money named in the note, is called the *face of the note.*

Notes should state value received, the date, face, rate, person to whom payable, and time of payment.

John A. Briggs is the *payee,* or the one to whom the money is to be paid.

George H. Brown is the *maker,* or the one who signs the note.

Find the interest on $600 at 5% for 3 years.

$600
.05
30.00 interest for 1 year at 5%
3
90.00 interest for 3 years at 5%

To find the interest, we multiply the principal by the rate for 1 year, and the product by the number expressing the time in years.

EXERCISE 39.

Find the interest on

1. $1250 for 4 yr. at 6%
2. $ 875 for 5 yr. at 5%
3. $275.50 for 2 yr. at 4½%
4. $1620 for 8 yr. at 4⅓%
5. $9750 for 3 yr. at 4%
6. $2250 for 7 yr. at 5%
7. $ 750 for 3 yr. at 3.5%
8. $1500 for 4 yr. at 47%
9. $ 900 for 2½ yr. at 7%
10. $4150 for 3½ yr. at 4½%
11. $2350 for 3 yr. 6 mo. at 4%.
12. $8775 for 2 yr. 3 mo. at 5½%
13. $ 375 for 4 yr. 4 mo. at 6%
14. $ 500 for 5 yr. 2 mo. at 3.5%
15. $1200 for 4 yr. 6 mo. at 4.2%

There are many methods of computing interest.

The following method is a most practical one. It is accurate, and it does much to develop a child's mathematical resources, inasmuch as it gives him power and skill in thinking out fractional parts.

Rule for interest. Multiply the principal by the rate per cent for 1 year. Draw a line to separate this result from the work below. Take such multiples or parts of the product as will give the interest for the required time.

Find the interest on $1250 for 3 yr. 5 mo. 10 da. at 6%.

$ 1250
.06
$ 75.00 = interest for 1 yr. at 6%
$225. = interest for 3 yr. at 6%
$ 25. = interest for 4 mo. at 6%
$ 6.25 = interest for 1 mo. at 6%
$ 2.083 = interest for 10 da. at 6%
$258.333 = interest for 3 yr. 5 mo. 10 da. at 6%

We first find interest for 1 yr., $75. Draw the line under it, as it is the fundamental part of the work—the part to which we constantly refer. The interest for 3 yr. = 3 times that of 1 yr. 3 × $75. = $225.

5 mo. is $\frac{5}{12}$ of 1 yr. but it is better to separate 5 mo. into 4 mo. and 1 mo.

4 mo. = $\frac{1}{3}$ of 1 yr., in this example $\frac{\$75}{3}$ = \$25.

1 mo. = $\frac{1}{4}$ of 4 mo., in this example $\frac{\$25}{4}$ = \$6.25

10 da. = $\frac{1}{3}$ of 1 mo., in this example $\frac{\$6.25}{3}$ = \$2.083

Sum of \$225, \$25, \$6.25, \$2.083 = \$258.333 = desired interest.

In like manner, separate 7 mo. into 6 and 1; 8 mo. = 6, 1 and 1; 9 mo. = 4, 4, and 1; 10 mo. = 6, 3 and 1; 11 mo. = 6, 4 and 1.

The desirability of having 1 mo. appear each time is to help in computing the interest for the days.

The easy fractional parts of a month will be 15 da. = $\frac{1}{2}$; 10 da. = $\frac{1}{3}$; 6 da. = $\frac{1}{5}$; 5 da. = $\frac{1}{6}$; 3 da. = $\frac{1}{10}$; thus 21 da. = 15 and 6; 23 da. = 10, 10 and 3; 25 da. = 15 and 10; 29 da. = 10, 10, 6 and 3, etc.

EXERCISE 40.

Find the interest on

1. \$1250 for 2 yr. 5 mo. 10 da. at 5%.
2. \$1620 for 3 yr. 7 mo. 15 da. at 4½%.
3. \$675.50 from Jan. 1, 1910, to Aug. 16, 1915, at 5%.
4. \$2250 from Mar. 15, 1911, to Oct. 25, 1916, at 6%.
5. \$950.75 from June 7, 1912, to Dec. 30, 1915, at 4%.
6. \$1750 from Aug. 12, 1911, to Jan. 15, 1916, at 5½%.
7. \$1500 from Sept. 15, 1912, to Dec. 20, 1915, at 6%.
8. \$1265 from July 1, 1912, to Mar. 5, 1916, at 4%.
9. \$1630 from Feb. 4, 1911, to Oct. 24, 1915, at 5%.
10. \$540.50 from June 8, 1912, to Sept. 14, 1914, at 4½%.
11. \$620.75 from Nov. 17, 1910, to April 27, 1913, at 6½%.
12. \$1250.50 from Nov. 20, 1912, to May 14, 1916, at 5%.

RATIO AND PROPORTION.

Ratio is the relation of one number to another of the same kind, expressed by the quotient.

It is another form of division.

The ratio of 4 to 5 is expressed, 4:5.

The *ratio sign* is the colon (:), and is read *is to*.

The first number in the ratio is called the *antecedent*.

The second number in the ratio is called the *consequent*.

The antecedent and consequent are called the *terms* of the ratio.

The ratio of two numbers may be expressed in the three following ways: $3 \div 6$, $\frac{3}{6}$, or 3:6.

The value of each is $\frac{1}{2}$.

As we can multiply or divide both terms of a fraction by the same number without changing its value, so we can multiply or divide both terms of a ratio by the same number without changing its value. Thus, $3:6=\frac{1}{2}$, or $6:12=\frac{1}{2}$, or $1:2=\frac{1}{2}$.

The term antecedent is another name for numerator or dividend; the term consequent is another name for denominator or divisor.

Find the value of the following ratios:

1. $3:27$ $\quad 12:24$ $\quad \frac{3}{4}:\frac{1}{2}$
2. $8:72$ $\quad 24:12$ $\quad$ 5 ft. : 20 in.
3. \$$2\frac{1}{2}$: \$15 $\quad 44:10$ $\quad \frac{3}{4}$ yd. : $\frac{3}{4}$ ft.

4. Divide 30 cents between two boys in the ratio of 2 to 3.

Each time a division is made, 5 cents are taken, of which the first boy gets 2 of the 5, or $\frac{2}{5}$; and the other boy gets 3 of the 5, or $\frac{3}{5}$.

$\frac{2}{5}$ of $30=12$ $\quad \frac{3}{5}$ of $30=18$ $\quad$ 12 cents and 18 cents.

The ratio $8:4=2$. The ratio $12:6=2$.

Thus the two ratios being equal to the same number, are equal to each other, and may be written $8:4=12:6$.

A *proportion* is an equality of ratios.

The first and last terms of a proportion are called the *extremes.*

The second and third terms of a proportion are called the *means.*

The test of a proportion is to have the product of the means equal the product of the extremes. Thus the product of the means divided by either extreme will give the other extreme; and the product of the extremes divided by either means will give the other mean.

Find the missing term, which is represented by $\times$ in the following:

$15:5=12:\times$

$\frac{5\times12}{15}=4$ $\quad$ Multiply the means and divide by the given extreme.

$15:5=12:4$

$15:\times=12:4$

$\frac{15\times4}{12}=5$ $\quad$ Multiply the extremes and divide by the given mean.

$15:5=12:4$

Find the missing term:

1. $3:\times=6:48$
2. $20:5=48:\times$
3. $\times:7=5\frac{1}{2}:11$
4. $36:6=12:2$
5. $3\frac{1}{2}:\times=2:\frac{3}{4}$
6. $3:\frac{1}{2}=\times:\frac{1}{16}$
7. $\times:\frac{4}{5}=\frac{5}{8}:\frac{3}{8}$
8. $\frac{1}{8}:10=\times:30$
9. $\times:180=5:20$
10. $25:75=1:\times$

A ship sailed 47½ miles in 5 hours. How long will she be in sailing 190 miles?

Let × represent the number of hours she will be in sailing 180 miles. For convenience make × (hours) the fourth term of the proportion.

$$\begin{array}{cccc} \text{miles} & \text{miles} & \text{hours} & \text{hours} \\ 47\frac{1}{2} & 190 & = 5 & \times \end{array}$$

$$\frac{5 \times \overset{4}{\cancel{190}}}{\cancel{47\frac{1}{2}}} = 20$$

$$47\tfrac{1}{2} : 190 = 5 : 20$$

Write the ratio 5 : ×.

5 must be the third term of the proportion, because the third and fourth terms form a ratio and must be of the same denominator.

We know that the ship will be longer in sailing 180 mi. than she was in sailing 47½ mi. This shows that ×, the consequent of the second ratio, will be greater than its antecedent, therefore to have an equality of ratios we must make the consequent of the first ratio larger than its antecedent.

If, however, we find that ×, the consequent of the second ratio, is to be less than its antecedent, we must make the consequent of the first ratio less than its antecedent, that the equality of the ratios may be preserved.

In performing examples in proportion, remember that the terms of a ratio must be of the same denomination. Write the second ratio, making ×, the number sought, the fourth term. Always ask if the consequent of the second ratio is to be larger or smaller than its antecedent, and from the answer determine the first ratio.

EXERCISE 41.

1. James purchased 15 acres of land for $72. How much did William have to pay for 37½ acres at the same rate?

2. If 7 men eat 10½ loaves of bread in a week, how many loaves will 25 men eat at the same rate in the same time?

3. A house was painted by 8 men in 6 days. How many men would be required to do the same work in 12 days?

4. If a man can perform a journey in 6 days, traveling 14 hours a day, how many days will be required if he travels only 7 hours a day?

5. Six horses consume a certain quantity of oats in 12 days. How long will the same quantity feed 36 horses?

POWERS AND ROOTS.

A *power* is the product of like factors.

The product of two like factors is the 2nd power, or *square* of that number.

9 is the square of 3 $(3 \times 3 = 9)$.
16 is the square of 4 $(4 \times 4 = 16)$.
25 is the square of 5 $(5 \times 5 = 25)$.

The product of three like factors is the 3rd power, or *cube* of that number.

27 is the cube of 3 $(3 \times 3 \times 3 = 27)$.

64 is the cube of 4 $(4 \times 4 \times 4 = 64)$.

The product of four like factors is the 4th power; of five like factors is the 5th power, etc.

The *exponent* is a small figure written a little above the number at the right, and it tells how many times the number is taken as a factor.

$6^2 = 6 \times 6 \qquad 7^3 = 7 \times 7 \times 7 \qquad 5^4 = 5 \times 5 \times 5 \times 5$

The *root* of a number is one of the equal factors of the number.

The *square root* of a number is one of the two equal factors of the number.

The square root of 81 is 9; of $\frac{9}{16}$ is $\frac{3}{4}$.

The *cube root* of a number is one of the three equal factors of the number.

The cube root of 125 is 5; of $\frac{8}{27}$ is $\frac{2}{3}$.

The symbol $\sqrt{}$, called the *radical sign*, written before a number, shows that the square root of the number is to be taken. $\sqrt{49}$ = square root of 49 = 7.

When some root other than the square root is desired, a small number, called the *index*, is written a little above and before the radical sign, to indicate what root is to be found. $\sqrt[3]{64}$ = cube root of 64 = 4.

$4^2 = 16 \qquad 3^2 = 9$

$8^2 = 64 \qquad 16^2 = 256$

$45^2 = 2025 \qquad 21^2 = 441$

The square of a number contains twice as many figures, or one less than twice as many figures, as the root.

Therefore, for every one or two figures in the power there will be one figure in the root, and for every three or four figures in the power there will be two figures in the root. These groups of two figures are called periods.

Thus in every root there will be as many figures as there are periods, or fraction of a period, in the power.

Since 45 = 40 + 5, the square of 45 may be obtained as follows:

$$\begin{array}{l} 40 + 5 \\ 40 + 5 \\ 40^2 + (40 \times 5) \\ \qquad\quad (40 \times 5) + 5^2 \\ \hline 40^2 + 2\,(40 \times 5) + 5^2 \end{array}$$

The square of any number made up of tens and units will contain the square of the tens + twice the product of the tens by the units + the square of the units.

Find the square root of 1225.

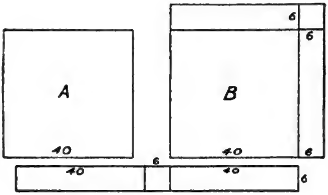
$$\begin{array}{r|l} \multicolumn{1}{r}{} & \overset{3}{12}\ \overset{5}{25} \\ \multicolumn{1}{r}{} & 9 \\ \cline{2-2} 65 & 325 \\ & 325 \end{array}$$

The first period, 12, contains the square of the tens' figure of the root.

The greatest square in 12 is 9. Write the square root of 9, which is 3, as the tens' figure of the root. Subtract the square of the tens' figure, and the remainder, together with the next period, contains twice the tens' figure × the unit + the unit ^{2}. Twice the 3 tens is 6 tens, and 6 tens are contained in 32 tens of the remainder, 5 times. The 5 is the units figure of the root, and to save one multiplication we also add the units figure to the right of the 6 tens in the divisor. The 65 is called the complete divisor. Multiply the complete divisor and subtract. There is no remainder.

The square root of 1225 is 35.

Find the square of 46.



Start with a square 40 units wide (Figure A). What is its length?

Increase the dimensions of the square 6 units. How long will the square be? How wide?

Note that the areas added are 2 equal rectangles, each as long as a dimension of the original square, and a small square, whose dimensions will be the width of one of the rectangles (Figure B).

$$\begin{array}{rl} 40^2 = 1600 & \text{area of original square.} \\ (40 \times 6)\, 2 = 480 & \text{area of two rectangles.} \\ 6^2 = 36 & \text{area of small square.} \\ \hline 46^2 = 2116 & \text{area of enlarged square.} \end{array}$$

Find the square root of 2116.

$$\begin{array}{r|l} \multicolumn{1}{r}{} & \overset{4}{21}\ \overset{6}{16} \\ \multicolumn{1}{r}{} & 16 \\ \cline{2-2} 86 & 516 \\ & \underline{516} \end{array}$$

The first period, 21, contains area of the original square, 1600. Subtracting this area, we have the remainder, 516.

516 contains the area of the two equal rectangles and the area of the small square.

We wish to find the width of the rectangles.

The length of the rectangles is 80 units, or twice the tens' figure in the root. This is our trial divisor. Divide the area of these rectangles by their length and we get 6, the width of the rectangle, or the units' figure in the root. Add this units' figure to the trial divisor, which gives the length of the two rectangles + the length of the small square. This is the complete divisor, 86. Multiply the length by the width and it gives 516 square units; subtract and nothing remains.

The square root of 2116 is 46.

Always begin at the decimal point to separate the number into periods.

If the number is not a perfect square, add periods of ciphers until the root has been found to the required decimal place.

We find the square root of a common fraction by taking the square root of both numerator and denominator. If either numerator or denominator is not a perfect square, change the fraction to an equivalent decimal and then take the square root of the decimal.

Find the square root of $\frac{3}{4}$.

$$\frac{3}{4} = .75 \qquad \begin{array}{r} .\overset{8}{75}\ \overset{6}{00}\ + \\ 64 \\ 166\overline{)1100} \\ \underline{996} \end{array} \qquad \sqrt{\tfrac{3}{4}} = .86+$$

Find the square root of 6,780,816.

$$\begin{array}{r|l} & \overset{2}{6}\ \overset{6}{78}\ \overset{0}{08}\ \overset{4}{16} \\ & 4 \\ 46 & 278 \\ & 276 \\ 5204 & 20816 \\ & \underline{20816} \end{array}$$

$$\sqrt{6780816} = 2604$$

When a dividend does not contain a trial divisor, place 0 as the next figure in the root, and at the right of the trial divisor. Bring down the next period and proceed as before.

Rule for square root:

1. Beginning at the decimal point, separate the given number into periods of two figures each.

2. Find the greatest square in the left-hand period, and write its root above the period as the first figure of the root.

3. Subtract the square of this root figure from the left-hand period, and to the remainder annex the next period for a dividend.

4. Double the root already found for a trial divisor, and omitting the right-hand figure of the dividend, divide and write the quotient as the next figure of the root, and also at the right of the trial divisor to form the complete divisor.

5. Multiply the complete divisor by the new root figure, and subtract the product from the dividend.

6. If there is a remainder, annex the next period for a new dividend. Double the root already found for a trial divisor, and proceed as before.

EXERCISE 42.

Find the square root:

1. 38809
2. 75076
3. 142129
4. 207025
5. 310249
6. 430336
7. 589824
8. 788544
9. 824464
10. 998001

11. A square hall contains 4096 sq. ft. What will it cost to put a paper border around it at $.37 a yard?

12. At $.48½ a foot, what is the cost of fencing a square field containing 5476 sq. rd.?

13. The area of a square field is 654481 sq. ft. What is its perimeter?

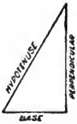
14. How many yards of curbing are required for a park containing 26244 sq. ft.?

15. A rectangular surface is 64 rd. by 81 rd. What are the dimensions of a square field containing the same area?

16. A rectangular lot is 648 yd. long and 162 yd. wide. Find the distance around an equivalent square lot.

17. What will it cost at $1.87½ a rod to build a fence around a square field whose area is 15⅝ A.?

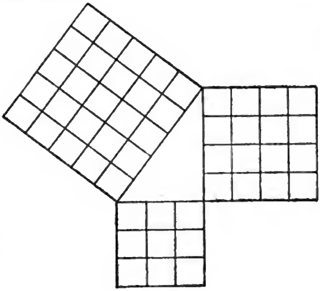
18. How much more will it cost to fence a rectangular field 216 rd. long and 24 rd. wide, than a square field of the same area at $2.25 a rod?



RIGHT TRIANGLE.

A *right triangle* is a triangle containing a right angle.

The *hypotenuse* is the side opposite the right angle. It is the longest side. The other two sides forming the right angle are called the *base* and *perpendicular.*



Draw a right triangle with the base 3 in. and perpendicular 4 in. The hypotenuse will be 5 in.

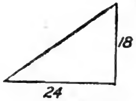
On each side of the triangle, draw a square, and divide each square into square inches. How does the number of units in the square of the hypotenuse compare with the number of units in the sum of the squares of the other two sides?

Learn—In any right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Hence, the square of either side equals the square of the hypotenuse less the square of the other side.

$$\text{hyp}^2 = \text{base}^2 + \text{perp}^2 \qquad \text{hyp} = \sqrt{\text{base}^2 + \text{perp}^2}$$
$$\text{base}^2 = \text{hyp}^2 - \text{perp}^2 \qquad \text{base} = \sqrt{\text{hyp}^2 - \text{perp}^2}$$
$$\text{perp}^2 = \text{hyp}^2 - \text{base}^2 \qquad \text{perp} = \sqrt{\text{hyp}^2 - \text{base}^2}$$

The base of a right triangle is 24 ft., and the perpendicular is 18 ft. What is the hypotenuse?



$24^2 = 576$ square of base.
$18^2 = 324$ square of perpendicular.
$\overline{900}$ square of hypotenuse.
$\sqrt{900} = 30$ length of hypotenuse.

Rule. To *find* the *hypotenuse,* having the base and perpendicular given: Add the square of the base and the square of the perpendicular, and find the square root of the sum.

Rule. To *find* the *base* or *perpendicular,* having the hypotenuse and other side given: From the square of the hypotenuse subtract the square of the given side, and take the square root of the remainder.

EXERCISE 43.

1. The base of a right triangle is 39 ft., and the perpendicular is 52 ft. What is the hypotenuse?
2. What is the diagonal of a rectangle 96 ft. long and 72 ft. wide?
3. A tree was broken 28 ft. from its root, and struck the ground 21 ft. from its base. What was the height of the tree?
4. What must be the length of a ladder to reach to the top of a chimney 48 ft. high, the foot of the ladder being 20 ft. from the chimney?
5. If the top of the ladder mentioned above be lowered 6 feet, how far will the foot stand from the chimney?
6. Two poles are 48 ft. apart. One is 40 ft. high and the other 76 ft. How long a line will connect their tops?
7. Find the diagonal of a square field containing 4 A. 145 sq. rd.

AREA OF SURFACES.

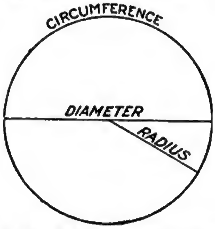
1. To find the *area* of a *rectangle,* multiply the base by the altitude.
2. To find the *area* of a *parallelogram,* multiply the base by the altitude.
3. To find the *area* of a *triangle,* multiply one-half the base by the altitude.
4. To find the *area* of a *trapezoid,* multiply one-half the sum of the bases by the altitude.

A *polygon* is a plane figure bounded by straight lines.

A *regular polygon* is a polygon having all its sides equal.

The *perimeter* of a polygon is the sum of its sides.

5. To find the *area* of a *regular polygon* of more than four sides, divide the polygon into triangles, and the area of the polygon will be the sum of the areas of the triangles.



A *circle* is a plane figure bounded by a curved line, every point of which is equally distant from the center.

The *circumference* of a circle is its bounding line.

The *diameter* is a straight line drawn through the center and terminating in the circumference.

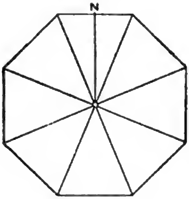
The *radius* is a straight line drawn from the center to the circumference. It is one-half of the diameter.

If the circumference of a circle is divided by its diameter, the quotient, expressed to the nearest ten-thousandth, is 3.1416. For ordinary use 3⅐ may be used in place of 3.1416.

Learn. 1. To *find* the *circumference* of a circle multiply the diameter by 3.1416 or 3⅐.

2. To *find* the *diameter* of a circle, divide the circumference by 3.1416 or 3⅐.

$\frac{\text{Circumference}}{\text{Diameter}} = 3.1416$. This ratio is usually expressed by the Greek letter π (pi).

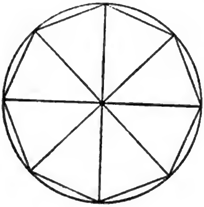


The area of the accompanying regular polygon (octagon) is the sum of the areas of the triangles. The area of a triangle equals ½ the product of its base by its altitude.

The sum of the bases of the triangle = the *perimeter* of the polygon.

The altitude (O N) of one of the triangles is the *apothem* of the polygon.

The area of this regular polygon = ½ of the perimeter × the apothem.



Reproduce the above regular polygon, and using the same center, draw the circumference of a circle.

Notice.—The circumference of the circle and the perimeter of the polygon are very nearly the same. Also, the apothem of the polygon and the radius of the circle are very nearly the same.

If the number of sides of the polygon were increased, the perimeter of the polygon would almost coincide with the circumference of the circle, and the apothem and radius would be the same.

Therefore. the *area* of a *circle* = ½ the circumference multiplied by the radius.

$$\text{Circumference} = D \times 3.1416$$
$$\tfrac{1}{2}\ \text{circumference} = R \times 3.1416$$

Substitute $R \times 3.1416$ in the above.

$$\text{Area of circle} = 3.1416 \times R \times R$$
$$\text{Area of circle} = 3.1416 \times R^2$$
$$\text{Area of circle} = \pi R^2 \text{ (the most convenient form to remember).}$$

EXERCISE 44.

1. The radius of a circle is 42 in. How many feet in its circumference?

2. What is the distance across a circular piece of ground which measures 57 rods around?

3. Find how far a carriage has gone when one of its wheels, measuring 3 ft. 8 in. in diameter, has made 1600 revolutions.

4. How long a piece of iron will a blacksmith require for the tire of wagon wheel 4½ ft. in diameter, if 6 in. are allowed for welding?

5. A horse is tied with a rope so that his head can reach 22 ft. from the stake in any direction. What is the area of the ground over which he can graze?

6. There are two circles drawn from the same center. The circumferences measure 132 ft. and 198 ft., respectively. Find the width of the ring formed by these two circles.

RULES FOR FINDING CURVED SURFACES.

1. The convex *surface* of a *prism* is the product of the perimeter of its base by its altitude.

2. The convex *surface* of a *cylinder* is the product of the circumference of its base by its altitude.

3. The convex *surface* of a *pyramid* is one-half the product of the perimeter of its base by its slant height.

4. The convex *surface* of a *cone* is one-half the product of the circumference of its base by its slant height.

5. The *surface* of a *sphere* is four times the square of its radius times 3.1416.

RULES FOR FINDING THE VOLUME OF SOLIDS.

1. The *volume* of a *regular prism* is equal to the product of the area of its base by its altitude.

2. The *volume* of a *cylinder* is equal to the product of the area of its base by its altitude.

3. The *volume* of a *pyramid* is equal to one-third the product of the area of its base by its altitude.

4. The *volume* of a *cone* is equal to one-third the product of the area of its base by its altitude.

5. The *volume* of a *sphere* is equal to $\frac{1}{3}$ the product of its radius and its convex surface.

EXERCISE 45. (REVIEW.)

1. Complete these proportions:

$7 : \quad = 20 : \frac{1}{5}$

$\frac{1}{4} : \frac{1}{12} = \quad : \frac{1}{3}$

2. If 18 horses eat 80 bu. of oats in 4 weeks, how many bushels will 16 horses eat in the same time?

3. Find the 3rd power of $\frac{5}{7}$.

4. Find the square root of 65.1249.

5. A ship was valued at $75,000, and was insured for $\frac{3}{4}$ of its value at $3\frac{1}{2}$%. Find the premium.

6. A man bought a farm of 80 A. of land for $3200, and sold it at a profit of $9.50 an acre. What was the gain per cent?

7. Find the side of a square that contains as many square feet as an oblong 210 ft. × $52\frac{1}{2}$ ft.

8. Write the decimal for

$\frac{1}{8}$%, $\frac{4}{5}$%, $\frac{1}{5}$%.

9. How many pecks of potatoes are there in 48 bu., 3 pk. and 6 qt.? Find the cost of the same at 40c per peck.

10. How many bricks 8 in. × 4 in. will be required to lay a sidewalk 4 rd. long and 6 ft. wide?

EXERCISE 46.

Henry Brown has on his wood-lot a pile of wood 54 ft. long and 4 ft high, which he sells to Joseph Taylor at $7.25 per cord.

1. Write how much money he should receive.

2. Write such a bill for the wood as Mr. Brown would make out. Receipt it yourself for Mr. Brown.

3. Write such a note as Mr. Taylor might give for the amount. Date it today, and make it payable on demand with interest.

4. Compute the interest on the note, or on the value of the wood, from date to the 27th of next month.

EXERCISE 47. (REVIEW.)

1. Find the interest on $4050 from April 14, 1910, to June 10, 1913, at 5%.

2. Mr. Jones sold 60 bu. wheat at $1.15 a bushel. This was 5% more than he paid for it. How much did he gain?

3. Express .625 and .1428 as common fractions in lowest terms.

4. If $\frac{3}{8}$ of a yard of silk cost $1.15, how many yards will cost $55.20?

5. How much did a lawyer receive for collecting a bill for $325 at 8%, and one for $850 at $7\frac{1}{2}$%?

6. Find the sum of these fractions: $\frac{8}{9}$, $\frac{23}{24}$, $\frac{27}{36}$.

7. If 136 masons can build a wall in 28 days, how many will be required to build it in 8 days?

8. If a merchant sells flour at $7.37 a barrel and gains 10%, what % would he gain if he sold it at $8.04 a barrel?

9. What will it cost to cement a cellar floor 48 ft. 6 in. long and 24 ft. wide at 45c a sq. yd.?

10. Mr. Brown bought a horse for $325, paid $60 for keeping him, and then sold him for $477.40. What per cent did he gain?

LESSON OUTLINES

AND

CLASSIFIED QUESTIONS

IN

NATURE-WORK GEOGRAPHY HISTORY BIOGRAPHY
LITERATURE THE ARTS AND SCIENCES
INDUSTRIES AND INVENTIONS

WITH PAGE REFERENCES

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INTRODUCTION

In order that our readers may readily appreciate the reliable and authentic information to be obtained from following the course of reading and study in *The Lesson Outlines*, we give a brief history of *The New Student's Reference Work:*

Over twenty years ago Mr. Beach prepared *The Student's Cyclopedia*, the pioneer reference work that has won the approval of the educators and the public. Then, with the assistance of a large corps of leading educators, he began gathering together new and valuable material, and after a long period of such preparation *The Student's Cyclopedia* was entirely rewritten. New ideas were incorporated, the scope of the work was so broadened that it became more than a mere cyclopedia, and a new work in three volumes was issued under the name of *The Student's Reference Work*. This has long been recognized as the standard work of its kind.

In making the latest edition, *The New Student's Reference Work*, our aim has been, not only to maintain the high *standard* character of *The Student's Reference Work* and to keep abreast of the times, but to move ahead along the most approved lines of educational work by securing the services and suggestions of those advanced and progressive educators who represent the best thought in the educational world.

The names of the educators who have contributed to *The New Student's Reference Work* are alone a sufficient guaranty of authenticity and excellence. We wish, however, to acknowledge here the splendid assistance that has been rendered by over two hundred city superintendents, who have contributed articles, and to many other educators who have given us encouraging and helpful ideas.

The Lesson Outlines are the result of an earnest wish on the part of the publishers to render the great wealth of information contained in *The New Student's Reference Work* more accessible and helpful than is possible even with our especially devised system of cross indexing. To this end we had a series of ideal outlines for study prepared. These were arranged by educators best fitted for the task, whose only instructions were to make the most perfect outlines possible. When completed, our indexers merely inserted the page references.

The Lesson Outlines are an aid to the teacher in summarizing subjects and in its suggestions. They are helpful to the student as an aid to school work in the preparation of special topics, in reviews and in securing a comprehensive grasp of main subjects. They are of inestimable value to the young man who may be denied the advantage of a college education and must depend on his own resources to become that best product of our American civilization—"a self-educated man."

The Outlines cover the various departments of knowledge and not only give a complete synopsis of a subject, but indicate the pages in *The New Student's Reference Work* where detailed information may be found. Today the student must be brief and accurate, and these Outlines enable him to meet the requirements without unnecessary expenditure of valuable time and energy. Suppose, for example, that a student, teacher or general reader wishes to write a paper or get a review of English literature of the eighteenth century or, in fact, of any period of literature. In these Outlines the guide posts of the world's literature are presented so clearly and effectively that there is photographed on the mind a definite picture of the main features in the literary life of the world from before the time of Confucius down to the most modern writers of fiction. We direct your attention for a moment to the Outline on Young Folk's Literature. Every mother knows how difficult it is to select suitable stories to tell and read to young children. There is so much reading material that is really worthless thrown on the market, that it requires considerable experience to make a wise selection.

It does not require much thought to realize how completely this graded list of literature for children covers the years of early childhood, when children demand stories, then on through the restless adolescent period when every boy craves the story of excitement and adventure, into the later high school and college ages, thus covering completely the dangerous periods in the child's life. Surely the educators appreciated the truth of the saying: "In making the right start, half the battle is won."

To the Outlines is added a series of over 6000 Classified Questions. These form a means of study that, in the hands of the general public, has proven its value by many years' experience. This Question idea was first introduced in *The Student's Cyclopedia*, which we published in 1893. Inasmuch as these Classified Questions have filled a special niche in the home life for so many years, that feature has not only been retained, but has been strengthened and broadened to cover practically every department of knowledge. The editor's aim has been to select live questions which develop thought and expression, as well as fasten in the mind of the student the very meat of the subject under consideration.

Entire families have spent evening after evening in studying the questions and their answers. Parents have declared that when the long winter evenings have passed they have been amazed at the vast amount of information obtained and the studious habits acquired by every member of the household. Teachers and parents have realized that a strong home tie has been developed through this method of study, that is a closer companionship and a stronger bond of sympathy between children and parents. This spirit of confidence in the home circle becomes the trusty safeguard in the future life of the boys and girls.

In a word: *The Lesson Outlines* have been prepared and arranged with all the skill that painstaking educators could command and is the *Key* to the vast library of information contained in *The New Student's Reference Work.*

THE PUBLISHERS.

OUTLINES

NATURE STUDY

SPECIAL REFERENCES:

- a. **As related to child life:** 1307.
- b. **Nature study in the lower grades:** 1307.
- c. **Material:** 1308.
- d. **Methods:** 1308.
- e. **The Camera in Nature Study:** 1309.

I. ANIMAL LIFE.

- 1. **MAIN CLASSES OF ANIMALS:** Animal kingdom 74; arthropoda 114; vertebrates 2015; tunicates 1950; geology 2133.
    - a. **Insects:** Illustrations — flies 687; "darning needle" or dragon fly 549; scarabæus or tumble-bugs 1687; butterflies 296; hornets 886; silkworm moth 1757; chinch-bug 389; potato-bug 1537; fire-fly 676; peripatus 1453; cockroaches 418; cochineal 417; canker or fire worm 322.
    - b. **Fishes:** 678; trout 1945; bass 179; cod 418; salmon 1666; perch 1451; pike 1490; haddock 821; mudfishes 1274.
    - c. **Amphibians:** Frogs 719; toads 1917; and salamanders 1664.
    - d. **Reptiles:** 1601; snakes 1773; alligators 52; lizards 1104; tortoise 1925; turtle 1958; terrapin 1892; crocodile 480.
    - e. **Birds:** 217; sparrow 1791; hawk 850; robin 1620.
    - f. **Mammals:** 1154; cat 347; dog 538; elephant 604; monkey 1252; horse 886; house-pets 889.

- 2. **STUDY OF INSECTS:** 928.
    - a. **Parts of an Insect:** 928; ant 76; bee 191 beetle 194; spiders 1798.
        - (1) **Head:**
            - (a) **Antennæ or feelers, what they are like:** Cockroaches 418; aphides or plant lice 82.
            - (b) **Eyes:** Insects 928; dragon-fly 548.
            - (c) **Mouth-parts:**
                - 1. **Upper lip and jaws:** Beetle 194; weevil 2064; ant-lion 81.
                - 2. **Parts for biting and for sucking:** 929; Butterfly 297; caterpillar 350; waterbug 2052.
        - (2) **Thorax:** 928.
            - (a) **The wings and legs:** Insects 929-30; crickets 477; grasshoppers 796.
        - (3) **Abdomen and the way it is joined to the thorax:** 2050.
    - b. **Stages through which most insects go in developing from the egg to the full-grown adult insect:** fly 687; mosquito 1269.
        - (1) **The egg stage:** 928; 297; 350.
            - (a) **Number of eggs:** Bee 191; mosquito 1269.
            - (b) **Where they are laid:** Bee 191; fly 687; mosquito 1269; moths 1270-71.
            - (c) **When laid:** Moths 1270; crickets 477; grasshopper 796; lady-bug 1019.

- **(2) The larval stage — worm or caterpillar stage:** Centiped 359; silkworm 1759; larva 1032; caterpillar 349.
    - (a) **Food of insects in this stage of development:** 1032.
    - (b) **The stage in which the most damage is done:** Army-worm 109; Cottonboll weevil 465.
- **(3) The pupal stage — cocoon:** pupa 1564; butterfly 297; silkworm 1757.
- **(4) Winged stage — full grown:** moth 1270; butterfly 297; ladybug 1019.
- **(5) The time of development from one stage to the next:** Cicada or 17 year locust 398; katydid 993.
- **(6) In what form the insect lives from one summer to the next:** mosquito 1269; codlin moth 419.

3. STUDY OF FISHES: 678; 677.

- **a. Some parts of the fish:** Heart 853; 67.
    - **(1) The gills:**
        - (a) **How they are used in breathing:** Respiration 1603.
        - (b) **Has the fish lungs?** Mudfishes 1274; fishes 678.
- **b. How the fish is protected:** sturgeon 1841; torpedo 1924; swordfish 1858; fish-culture 677.
- **c. Food of the fish:** 678; 1734.
- d. **Fish-eggs:** 677; 678.
    - (1) **When and where laid:** 1827.
    - (2) **Number of eggs:** 589, 678.

4. STUDY OF THE FROGS — AMPHIBIANS: 719; Animal life 524; amphibia 65; salamander 1664; egg 589; blood 401; heart 854.

- **a. Their development:**
    - **(1) Their Eggs:** 1917.
        - (a) Appearance: 1917.
        - (b) **Jelly-like part around the real egg inside and the two purposes of the jelly:** Toad 1917.
        - (c) **Where they are laid:** Salamander 1664.
    - **(2) The Young Tadpole:**
        - (a) **Its appearance at first:** 719; 1917.
            - 1. **Lack of legs:** 65.
            - 2. **The gills:** 719; 65.
        - (b) **Why it cannot live on land:** 719.
    - **(3) The Secondary Stage of Development:**
        - (a) **Disappearance of gills and development of lungs:** 720; 65.
        - (b) **Development of a pair of hind legs, then a pair of front legs:** 720; 1917.
        - (c) **Shrinking of the tail:** 720; 1917.
    - **(4) The Full-Grown Amphibian:**
        - (a) **Why and how can live on land:** 719.
        - (b) **Food of the Amphibians:**
            - 1. **Of what it consists.**
            - 2. **How it is obtained.**
            - 3. **The peculiarity of the tongue and how it is used in getting food.**
        - (c) **Amphibians as destroyers of insects:** 1344; 1918.

5. STUDY OF REPTILES: 1601; 589.

- **a. Main kinds of reptiles:** Snakes 1773; turtles 1958; alligators 52; lizards 1104; crocodile 480; dragon 548; chameleon 364; gila monster 765.

- **b. Snakes:** 1773; rattlesnake 1588; copperhead 452; boa 231; cobra 417.
  - **(1) Color, scales and fangs:** 1773.
  - **(2) Moulting of skin:** 1773.
  - **(3) Means of movement:** 1773.
  - **(4) Food:**
    - **(a) Of what it consists:** rattlesnakes 1588; copperhead 452.
    - **(b) How obtained:** black snake 223.
    - **(c) How digested:** Boa 231.
- **c. Turtles:**
  - **(1) Protective covering of the turtle:** 1958.
  - **(2) Different kinds of turtles:** 1959.
  - **(3) Manner of swimming and diving:** 1959.
  - **(4) Food, how obtained, of what it consists:** 1959; 1925.
  - **(5) The eggs of the turtle:** 1959; 589.

5 STUDY OF BIRDS:

- **a. Classification of birds:** 217.
  - **(1) As to zone on the earth where found:**
    - **(a) Tropical birds:** parrots 1425; birds of paradise 218.
    - **(b) Birds of temperate zones:** hawks 850; crows 482; sparrows 1791.
    - **(c) Birds of cold climates:** Auk 138; goose 780; migration 1223; owl 1404.
  - **(2) As to the habitat without regard to climate:**
    - **(a) Water-birds:**
      - **1. Divers:** like the loon 536; gull 814; albatross 39; pelican 1442.
      - **2. Swimmers:** like the duck 557; goose 780; swan 1853.
      - **3. Waders:** like the heron 869; crane 473; and flamingo 680.
    - **(b) Shore-birds:** like the snipe 1773; and plover 1505.
    - **(c) Land-birds:** like the quail 1570; turkey 1995; robin 1620; and bluebird 231.
- **b. Things to notice in studying birds:**
  - **(1) Size — compared with some very common bird, as the robin which measures 10 inches:** 1620; lark 1031; oriole 1394.
  - **(2) Color:**
    - **(a) Is it to attract attention like the Baltimore oriole's?** 164.
    - **(b) Is it for protection like the meadow larks?** 1194.
    - **(c) Notice the differences in color between the male and the female:** as in the bobolink 232.
  - **(3) Notice the special markings:** as in the plover 1505; the owl 1404.
  - **(4) The shape:** as in the loon 536; the flamingo 680; the emu 613.
  - **(5) The bill, wing, tail and feet:** as in the pelican 1442; hummingbird 898; falcon 647; albatross 39; gull 813; peacock 1434; condor 440.
  - **(6) Movements on land:** as skulking the rail 1581; walking the adjutant 14; running, the sandpiper 1674; ostrich 1398; **diving, the divers 536; swimming, the ducks 557.**

- (7) **Their movements in the air:** speed, the falcon 647; endurance, the kite 1007; floating, the buzzard 297; dashing, the fly-catchers 687; the fishhawks 678.
- (8) **Their songs:** call-notes and alarm-notes, the Virginia nightingale 334; the canary 321; the mockingbird 1245; the bittern 221; whooping crane 473.
- (9) **The food of birds, and how they obtain it:** the crows 482; the adjutant 14; the vultures 2031; the hawks 850; the kingfisher 1004; the owls 1403; the nighthawks 1350.
- (10) **The location and forms of their nests; the number and color of their eggs; and the way their nests are constructed:** birds' nests 217; the oven-bird 1002; thrush 1907; the oriole 1394; the tailor-bird 1865; the swallow 1852; the eggs 589; bob-white 233; weaver-bird 2060.
- (11) **The migration of birds:** 1223.

7. STUDY OF MAMMALS:

- a. **The characteristics which distinguish mammals from other animals:** 1154.
- b. **Important classes of mammals:** 1154.
  - (1) **Marsupials:** 1177; kangaroo 988; opossum 1387; wombat 2105.
  - (2) **Rodents:** 1623; rats 1588; rabbits 1577; porcupine 1528; gophers 781; beavers 188.
  - (3) **Hoofed animals:** Ungulates 1966; cow 352; horse 886; pig 1856; deer 513; 1599.
  - (4) **Carnivora:** tiger 1911; wolf 2103; fox 703.
  - (5) **Primates: Manlike animals:** monkeys 1252; chimpanzees 388; apes 81.
- c. **How each kind of mammal is specially fitted to live as it does:** size; strength; legs; teeth; jaws; feet. (See references above.)
- d. **Some domesticated mammals:** House-Pets 889; dog 538; cat 347; sheep 1736; cow 352; hog 1856; horse 886.
  - (1) **Animal from which each has probably developed:** evolution 637. (See under above heading.)
  - (2) **How they first might have been tamed:** 538; 348; 886.
  - (3) **Which was probably domesticated first?** 352; 538; 1736.
  - (4) **The relation between the teeth and the kind of food the animal eats:** 886; 889; 540.
  - (5) **The methods of defence of the domesticated animals:** 232; 539.
  - (6) **Which animals are best protected from the cold?** Sheep 1736; beaver 188; bear 185.
  - (7) **The relative intelligence of the different domesticated animals:** 348; 539.
  - (8) **Which wild animals are most like each of the main domesticated animals?**
    - (a) **Horse:** 886; ass 122; zebra 2129; quagga 1569.
    - (b) **Dog:** 539; wolves 2103; jackals 952.
    - (c) **Cat:** 348; tiger 1911; lion 1077; leopard 1056; puma 1560; jaguar 955.
- e. **Two common wild animals:**
  - (1) **The squirrel:** 1806; 1623.
    - (a) **How the squirrel is suited to his manner of life.**
    - (b) **Characteristics of his teeth, feet, tail, fur.**
    - (c) **The kind of food which the squirrel eats.**
    - (d) **How food is stored.**
    - (e) **How he lives through the winter.**
    - (f) **The summer home and the winter home.**
  - (2) **The rabbit:** 1577; 837.

    Note: Study with same outline as above for the squirrel, noting the difference between the rabbits and hares.

II. PLANT LIFE.

1. VARIETIES OF PLANTS:

a. Flowering plants that reproduce themselves by enclosed seed:

- **(1) Kinds:** 73 (Angiosperms).
  - (a) **Trees:** woody stem, single 1940; trunks grow at least 20 feet tall, oak 1367; maple 1166; apple 95.
  - (b) **Shrubs or bushes:** woody stem — not a single main trunk, rose 1633; briar 1855.
  - (c) **Vines:** woody, slender climbing stem, grape 794; ivy 950; pea 1432; Virginia creeper 2035; morning-glory 1263; clematis 407.
  - (d) **Herbs:** plants with stems not woody, dying down to the ground each year, beets 1845; grass 795; grains 2073; strawberries 1837; mustard 1292; mint 1237; saxifrage 1685.

b. Flowerless plants that reproduce themselves by exposed seed:

- **(1) Kinds:** 818 (Gymnosperms).
  - (a) **Evergreens of temperate zone:** conifers 443; pine 1491; cedar 354.
  - (b) **Cycads of tropics:** 492.
  - (c) **Ginkgo — maidenhair tree:** 767.
  - (d) **Gnetums of the deserts:** 818.

c. Flowerless plants reproduced by means of spores instead of seeds:

- **(1) Kinds:** 1897.
  - (a) **Ferns:** common forms of the woods 656.
  - (b) **Mosses:** bare — soil-moss 1282; hair-moss 1270; hepatica 865; peat 1436; 1125.
  - (c) **Lichens:** gray growths on fence-boards and rocks 1859.
  - (d) **Algæ:** sea-weeds and slimes on surface of ponds 48; 392; 904; 491; 1463; 1609; 522.
  - (e) **Fungi:** moulds — yeasts 2121; mushrooms 1284; grain smut 227; 1479; 178; 17; 1949; 1678; 1420.
  - (f) **Bacteria:** 154 plants that cannot be seen with the naked eye — smaller than the finest dust 657; 761; 1633.
- **(2) How reproduced:** by means of spores 1803; 1601; 1796; 117; 1804; 661.

2. MEANS OF REPRODUCTION:

a. Flowers — fitted to produce seed:

- **(1) Parts:** 686.
  - (a) **Stamens:** produce pollen 1808.
  - (b) **Stigma:** receives pollen 686.
  - (c) **Calyx:** floral display 312.
  - (d) **Corolla:** 459.
- **(2) Forms:** 925.
  - (a) **Single.**
  - (b) **Clusters.**

- **(3) Fertilization:** 657.
  - **(a) Self-pollination:** 1518.
  - (b) **Cross-pollination:** 1518.
  - (c) **By insects:**
    - 1. Nectar feeding: like the butterflies and moths 1519.
    - 2. Pollen feeding: like the bees and wasps 1519; 192.
    - 3. How the insects know the food: 1519.

- **b. Fruits:** contain mature seed 721; 1523.
  - (1) **Kinds:** 721; pear 1434; apple 85; gourd 787; gooseberry 781; raspberry 1587.
  - **(2) How distributed:** 1717; 1519.
    - (a) **Wind:** 1718; milkweed 1226; catalpa 348; maple 1166; tumbleweed 1950.
    - (b) **Water:** 1718.
    - (c) **Animals:** 1718.
    - (d) **Explosion of pod:** violet 2022.
  - **(3) Special adaptation for seed-distribution:** 1718.
    - (a) **Seed wings:** 1894; maple 1166; 1718.
    - (b) **Plumes:** 1718; milkweed 1226; catalpa 348.
    - (c) **Barbs:** 1718; dandelion 500.
- **c. Runners and cuttings:** 1552; 1643.
- **d. Selections and crossing to obtain new varieties called hybrids:** 1500; 789.

3. GERMINATION: 760; 657; 614; 1718.

- **a. Parts of seed:** 611.
  - (1) **Covering:** 931; 1894.
  - (2) **Cotyledon:** 465.
  - (3) **Caulicle:** 353.
  - (4) **Plumule:** 1506.
- **b. Development:**
  - (1) **Plumule developing into stem:** 1747.
  - (2) **Radicle into the root:** 1632.
  - (3) **Cotyledons:** 611.
    - (a) Leaflike.
    - (b) Not leaflike.

4. NOURISHMENT OF PLANTS: 1366; 532; 1420; 1242; 847.

- **a. Green plants:** that can make their own food.
  - (1) **Chlorophyll:** green bodies that do the work 393.
    - (a) **Work:** to provide nourishment for leaf 690
  - (2) **Chemical changes in leaf:** 1479; 18; 1041.
    - (a) **Make carbohydrates and proteids:** 1479.
    - (b) **Give off oxygen and vapor:** 1936.
    - (c) **Put food in solution:** 531.
    - (d) **Respiration:** 1602; 1210.
  - (3) **Work of roots and stems:** 2051; 1632.
- **b. Plants not green:** having no chlorophyll, they cannot manufacture own food.
  - (1) **Kinds:** 724: mushrooms 178; moulds 1479; mildews 117; truffles 1946; yeast 2121; rust 1649; toadstools 178.
  - (2) **How they live:** 1678; depend on green plants and on animals 1420; 1859.
  - (3) **Where they grow:** 1479.

5. ROOTS OF PLANTS: 1632; 2051.

- a. **Purpose:** to hold fast and absorb food 1294.
- b. **How direction is determined:** water and gravity 859.
- c. **Kinds:** taproot and hair-roots 1632.

6. TREES:

- **a. Kinds:** 693; 1940.
  - (1) **Leafshedding:** 512; maple 530; 1166; oak 1367; apple 85; ash 117; elm 609; beech 192; tulip 1949; hickory 872; horse-chestnut 887; catalpa 348.
  - (2) **Evergreen:** do not shed leaves, cypress 492; pine 1492; fir 675; hemlock 860.
- **b. Parts:**
  - (1) **Roots:** 1632.
    - (a) **Ascent of water:** 2051.
    - (b) **Vascular bundles:** 2004.
  - (2) **Trunk:**
    - (a) **Bark:** 172.
      - 1. **Differences in bark:** 462.
      - 2. **Work of bark:** 466.
      - 3. **Growth of bark:** 621.
        - a. How wood is formed on inside: 1678; cambium 312; blast 179; trees 1940; heartwood 854.
  - (3) **Wood:** 1930.
    - (a) **Heartwood:** 854.
    - (b) **Sapwood:** 1673.
    - (c) **Rings and layers and their meaning:** 1940.
  - (4) **Branches:** 259; 818.
    - (a) **Different positions in various trees:** pine 1492; elm 609; hemlock 860.
  - (5) **Flowers and fruits of trees:** 1367.
    - (a) **Shade trees:** oak 1367.
    - (b) **Fruit trees:** 721.
      - 1. **Dry:** maple 1166.
      - 2. **Fleshy:** peach 1434; plum 1506; cherry 377; apple 85; pear 1435.
    - (c) **Forest trees:** 693.
  - (6) **Leaf:** 1480; Cyclic; Spiral.

7. AGRICULTURAL PLANTS:

General References: agriculture 26; balanced ration 159; ensilage 619.

- **a. Forage crops:** 651; alfalfa 46; corn 457.
  - (1) Work: benefit to soil 1353; root tubercles 1633.
- **b. Grains and grasses:** 795; wheat 2072; rye 1650; rice 1610; oats 1638; pea 1432; millet 1227; alfalfa 46; clover 413; cowpeas 470; buckwheat 283.
  - (1) **Character of roots:** nitrogen crops 1352; root 1632; root pressure 1633; root stock 1633; root tubercles 1633.
  - (2) **Stems:** 795; 1821.
  - (3) **Flower:** 795.
  - (4) **Difference in grains:**
    - (a) **Length of root:** 46.
    - (b) **Hardiness:** 283; cowpeas 470; rye 1650; oats 1638.
- **c. Root crops:** tuber 1948; potato 1537.
  - (1) **Difference in character:** 1632.
  - (2) **Materials taken from soil:** phosphates 1475; potassium 1537; sulphur 1846; nitrogen 1353; fertilizers 657; manures 1165; rotation of crops 1636.

III. PHYSICAL NATURE STUDY:

1. STUDY OF ROCKS: Geology 747; Evolution 630.

- **a. The main kinds of rocks in the earth's crust:**
  - **(1) Unstratified rock:**
    - **(a) Granite, rock made up of crystals — mainly quartz:** 1571; 792; 653; 1036.
      - **1. The "hard-heads" of the fields:** 553.
    - **(b) Trap rock, dark, granular rock:** 1938; 177.
      - **1. The Palisades of the lower Hudson River:** 1938; 894; 1571.
  - **(2) Stratified rock — which is in layers:**
    - **(a) Sandstone, rock made of grains of sand held together by a cement:** 1673; 1674.
      - **1. Notice the material of which gravel stones are made:** sand 1673; gravel 796.
      - **2. "Brown stone" houses:** Ohio 1374; sandstone 1674.
    - **(b) Limestone, composed mainly of lime:** 1072.
      - **1. "Flag stone":** 1773; chalk 363; limestone ledges 1072; marble 1167.
    - **(c) Shale, a finely stratified rock made from mud and silt:** 1733; 406.
    - **(d) Slate, a clay rock made from shale by great heat:** 1733.
      - **1. Slate roofing:** pencils 1444; slates 1733.
    - **(e) Clay, mainly from the decay and powdering of other rock:** 406.
      - **1. Brick and potter's clay:** 1538; 265.
- **b. The making of rock:**
  - **(1) Igneous rock, rock which has been molten, unstratified:**
    - **(a) The first rock of the earth:** 638; 1529; 747.
    - **(b) Granite:** 792; trap rock 1938; hardened lava 1036.
  - **(2) Sedimentary rock — stratified:**
    - **(a) Made from material deposited by water in the ocean, lakes and beds of streams:** shale 1733; sandstone 1674; limestone 1072.
    - **(b) How the material is broken off and worn away from the older igneous rock:** sand 1673; Sahara 1654; earth 574; drift 553.
    - **(c) How the material is carried by water:** alluvium 53; earth 574; chalk 363.
    - **(d) How the material is deposited:** sand 1673; earth 574; alluvium 53.
    - **(e) Cementing of the particles together by lime and silica:** pebble 1437; shale 1733; silica 1757; lime 1071.
      - **1. Effect of heat in this:** mineralogy 1231; lime 1071.

- **(3) How rock fossils are made in the sedimentary rock:**
    - **(a) The fossils of plant-life:** fossil 701; geology 749; paleontology 1409; evolution 638.
    - **(b) The kinds of plants which are shown:** geology 749; fossil 701.
    - **(c) The fossils of animal life which are found:** horse 886; geology 750; evolution 638.
- **(4) The formation of coal:** 413. (Study with reference to outline.)
    - **(a) Luxuriant vegetation in marshes, warm climate.**
    - **(b) Slight sinking of the land so as to make a shallow sea.**
    - **(c) Deposit of sediment material on the fallen vegetable growth.**
    - **(d) Increased pressure and heat to change part of the vegetable material to coal.**
- **(5) The stages in the making of coal:** peat 1436; brown coal 1070; soft or bituminous and hard or anthracite coal 413.

c. The making of soil:

- **(1) Kinds of soil:**
    - **(a) Sandy soils:** 1778; 1673.
    - **(b) Clayey soils:** 1778.
    - **(c) Vegetable soil:** 1778; 1636; 53.
    - **(d) Mixtures of clay and sand with vegetable matter to make sandy and clayey loam:** 1165; 1353; 898.
- **(2) How the decay and disintegration of rock are brought about:** the work of water, frost, temperature and glaciers: 770; physiography 1483; Sahara Desert 1654.

2. STUDY OF THE ATMOSPHERE:

a. Its position in relation to the earth: 34.

b. Height to which the air extends: 34.

- **(1) How the height is known:** aeronautics 18; barometer 174.
- **(2) Highest balloon ascensions:** aeronautics 19; Gay-Lussac 741.

c. Pressure of the air on the surface of the earth — amount per square inch or foot: 33.

d. The decreasing density of the air as we ascend: aeronautics 18; air 34; barometer 174.

- **(1) Difference between density at base and tops of mountains:** barometer 174.

e. The characteristics of the air:

- **(1) Tasteless, odorless, colorless, elastic; it has weight and is compressible:** air 33; nitrogen 1353.
- **(2) Why we do not feel its weight:** 33.

f. Composition of air:

- **(1) Oxygen, which makes things burn and which, in breathing, we take from the air: its amount** 1405; 739.
- **(2) Nitrogen, the work which it does for us:** the amount in the air 1353; 739.
- **(3) Carbonic acid gas, its relation to animal and plant life:** 332.
- **(4) Water-gas or vapor:** 2051; evaporation 636; gas 739; barometer 174; clouds 412; natural gas 1306.

- **g. Moisture of the air:**
  - **(1) Evaporation of water:**
    - **(a) Under what conditions evaporation goes on best:** 636.
    - **(b) Temperature and dryness of air:** evaporation 636; rain 1582.
    - **(c) Places from which most of the water is evaporated:** Sahara Desert 1654; Dead Sea 570; Tibet 1909; Atacama Desert 129.
  - **(2) Condensation of vapor:**
    - **(a) How condensation is brought about:** rain 1582; fog 688; distillation 535; frost 720.
    - **(b) What is meant by the dew-point:** 526.
    - **(c) Clouds, what they are and how formed:** 412.
    - **(d) Fog and mist:** 688.
    - **(e) Rain:** how it is formed 1582.
    - **(f) Snow and hail:** how they are formed and how they differ 1773; 824.
    - **(g) Dew and frost:** what each is and how each is formed; how they differ from each other; best conditions for formation; effect of wind and clouds on formation: dew 526; frost 720; rain 1582.

3. ELEMENTARY ASTRONOMY:

- **a. The nebular theory:** 1316; 1030; 127.
  - **(1) The original nebulous mass:** 1316; 127.
  - **(2) Condensation of part of the mass and the resulting increase in rate of rotation:** 1316.
  - **(3) Throwing off of parts due to centrifugal force:** 1316.
  - **(4) Masses making what we call planets thrown off from the sun:** 1316.
- **b. The eight planets with their satellites:** 1499; 1682; names, size and position in relation to the sun and the earth 1500; sun 1848; moon 1259; Kepler 1000.
- **c. The earth — our planet:**
  - **(1) The movements of the earth:**
    - **(a) Rotation:** time of rotation, inclination of the axis 573.
    - **(b) Revolution:** time of revolution, shape of path around the sun 573; gravitation 796; equinox 622; eclipse 579; Copernicus 451.
- **d. The moon — the satellite of the earth:** 1259.
  - **(1) Size:** 1259.
  - **(2) Distance from the earth:** 1259; 573.
  - **(3) Character of its surface:** 1209.
  - **(4) Its lack of atmosphere and of life:** 1259.
  - **(5) Why its shape apparently changes:** 1259; 579.
- **e. The fixed stars:** 1813.
  - **(1) The North Star:** 1360.
- **f. Meteors and comets:** 1212; 432; 129.
- **g. The Milky Way:** 1226.

GEOGRAPHY

I. THE EARTH AS A WHOLE:

1. THE SHAPE OF THE EARTH: 573; 745; 730; 451.
- **a. Proofs that it is spherical:** 573; 127.

2. THE SIZE OF THE EARTH:
- **a. Length of circumference and diameters:** 573.

3. MOTIONS OF THE EARTH:
- **a. Rotation:** 573; 451; 279; 730.
  - **(1) What is meant by poles and axis:** 573; 1516.
  - **(2) The Pole Star and the Big Dipper:** 1516; 186.
  - **(3) Cause of daylight and darkness:** 573; 1848.
  - **(4) Longitude and Time. The Meridian of Greenwich:** 1204; 807; 1114; 1913.
- **b. Revolution:**
  - **(1) The Earth's orbit:** 574; 451; 1000; 1344; 127; 796.
  - **(2) The angle of inclination:** 573; 1544; 2133.
  - **(3) The cause of the seasons of the year:** 574; 1715.

4. THE CONTINENTS AND THE OCEANS:
- **a. Relative location and areas:** No. America 58; So. America 61; Africa 22; Asia 119; Australia 142; Europe 632.
- **b. The oceans:** Atlantic, 132; Pacific, 1407; Indian, 921; Arctic, 94; Antarctic, 77.
- **c. The movements of the water of the oceans:**
  - **(1) Ocean currents — causes:** 1369; 813; 1017.
  - **(2) Tides — causes:** 1910; 1259.
  - **(9) Waves — causes:** 2058.

5. MEANS BY WHICH THE EARTH'S SURFACE IS CHANGED:
- **a. Work of volcanic forces:**
  - **(1) Geysers, hot springs, volcanoes, earthquakes:** 762; 2027; 1805; 574.
  - **(2) Rising and sinking of land:** 2028; 749; 1483.
- **b. Work of the atmosphere:**
  - **(1) The changes of the atmosphere:** 33; 1931; 2094; 1833; 750.
  - **(2) How it makes soil:** 1778.
  - **(3) The winds:** 2094; Trade, 1931; monsoon, 1253; simoom, 1759; cyclone, 492.
- **c. Work of running water:**
  - **(1) How it wears away the earth's surface:** 747; 2051; 100.
  - **(2) How it carries earthy material and deposits sediment:** 518; 1240; 590; 2122; 53.
  - **(3) The general effect of running water:** 2051.
- **d. Work of the glaciers:**
  - **(1) How they wear away the land:** 770; 1206; 365.
  - **(2) How they make deposits of rock and soil:** 553; Soils, 1778.
  - **(3) Which part of the Earth has been most affected:** 750.

6. DISTRIBUTION OF PLANTS AND ANIMALS ON THE EARTH:
- **a. Plants:**
  - **(1) Vegetation regions:** Africa, 23; America, 59; Central America, 60; South America, 61; Asia, 119; Austria, 145; Europe, 633; France, 705; German Empire, 756; Mexico, 1215; Italy, 947; Spain, 1788.
  - **(2) Control by moisture, soil, heat, latitude and altitude:** Iceland, 911; Soils, 1778; Agave, 25; Crops, 29; Australia 142.
  - **(3) How plants are adapted to conditions in which they live:** 1501.
  - **(4) The great deserts, grasslands and forests of the world:** Africa, 22; Gobi, 776; Sahara, 1654; Mohave, 1247; Australia, 142; Pampas, 1415; Tibet, 1909; Texas, 1895; Central America, 60; So. America, 61; Black Forest, 222; Forest Reserves, 693; Russia, 1646; Mexico, 1214.

b. Animals:
(1) Carnivorous and herbivorous animals: 74; 678; 65; 1601; 217; 1154.
(2) Animals of the world: See color plates and half tones 24; 62; 144; 677; 1252; 1309; 1577, 1812; 1958.

7. THE PEOPLE OF THE WORLD:
a. Races: 1578.
(1) Their distinguishing characteristics: 22; 60; 118; 142.

I. THE CONTINENTS:

Note: Study the continental divisions, as given below, with special reference to the following outline:

1. SIZE AND POSITION IN RELATION TO OCEANS AND OTHER CONTINENTS:
a. Position on the earth.

2. CHARACTER OF COAST-LINE:
a. Location of important bays and gulfs.
b. The islands along the coasts.

3. SURFACE:
a. The highlands.
(1) Mountains and plateaus, heights and areas.
(2) Location, character, extent.
b. Drainage and divides — the largest rivers.
c. Coastal plains.

4. VEGETATION AND ANIMALS.

5. INHABITANTS.

III. GEOGRAPHY OF THE COUNTRIES OF THE WORLD:

Note: Each of the divisions given below to be studied with the following outline:
a. Area, location, character of surface, mountains, rivers and lakes—drainage, capitals and important cities — with reasons for importance.
b. Climate and soils.
c. Resources — agriculture, mining and manufacturing. Kinds, quantity, importance of products.
d Exports and imports.
e. Races.

1. NORTH AMERICA: Divisions, 60; Canada and Newfoundland 316; 1341; United States, 1967; Mexico, 1214; Central America, 60; West Indies, 2070.
a. Canada and Newfoundland:
(1) Provinces:
(a) British Columbia: 269; chief cities 2001, 2019; chief rivers 710; islands 270, 2001, 1573; mountains 1622.
(b) Alberta: 39; chief cities 307, 583, 1058, 1197; chief rivers 1692; railroads 320, 792.
(c) Saskatchewan: 1681; chief cities 1598, 1547; rivers 1681, 397; railroads 320, 792.
(d) Manitoba: 2095; chief cities 2095, 260; lakes 2095, 2096, 1022; rivers 1596.
(e) Ontario: 1385; chief cities 1924, 1399, 831, 1111, 1005, 260, 2094, 810, 1662, 1461, 1836; lakes 1022, 1352, 1383; canals 1683, 2065; water boundaries 900, 755, 1656, 524, 624, 1345, 1385, 1659, 1400; water powers 319, 1346.
(f) Quebec: 1571; chief cities 1258, 1573, 1657, 896, 1739; rivers 1659, 1400; lakes 1658, 365, 1572.
(g) New Brunswick: 1324; cities 1658, 1250, 712; water boundaries 724, 383, 1659, 362; rivers 1658, 1324.

(h) **Nova Scotia:** 1362; Cape Breton Island 328; chief cities 827, 1858, 769; water boundaries 724, 132, 1659.

(i) **Prince Edward Island:** 1547; chief city 372; railroad 1547.

(2) **Districts and Territories:**

(a) **Yukon:** 2127.

(b) **Mackenzie:** 1138.

(c) **Keewatin:** 995.

(d) **Ungava:** 1966.

(e) **Franklin:** 708.

(1) **Newfoundland** 1341; **Labrador** 1016.

b. United States:

(1) **New England States:** Connecticut, 443; chief cities 845, 267, 1326; Maine, 1149; chief cities 137, 166, 1532; Massachusetts, 1184; chief cities 248, 312, 2109, 1121; New Hampshire, 1325; chief cities 439, 1156; Rhode Island, 1606; chief cities 1555, 1343; Vermont, 2012; chief cities 1257, 292.

(2) **Middle Atlantic States:** New York 1331; chief cities 38, 1334, 285, 1860; New Jersey, 1327; chief cities 1941, 1340, 970; Pennsylvania, 1446; chief cities 843, 1496, 1465; Delaware, 516; chief cities, 547, 2090; Maryland, 1181; chief cities 74, 162; Virginia, 2023; chief cities 1612, 1355; W. Virginia, 2071; chief cities 371, 2075.

(3) **Southern Atlantic States:** North Carolina, 1357; chief cities 1583, 2090, 372; South Carolina, 1784; chief cities 430, 371, 804; Georgia, 752; chief cities 132, 1683, 137; Florida, 683; chief cities 1867, 954, 1868; Alabama, 35; chief cities 1244, 218.

(4) **Southern States of the Mississippi Valley:** Mississippi, 1240; chief cities 953, 2018, 1207; Tennessee, 1889; chief cities 1303, 1201, 1009; Louisiana, 1118; chief cities 182, 1330, 1748; Arkansas, 100; chief cities 1101, 698, 888; Texas, 1895; chief cities 141, 1671, 891; Oklahoma, 1376; chief cities 817, 1378, 1736, 619.

(5) **Central States:** Missouri, 1241; chief cities 966, 1659, 991, 1658, 979; Illinois, 915; chief cities 1805, 379, 1450, 1575, 1622; Iowa, 934; chief cities 523, 556, 1761, 506, 355; Wisconsin, 2098; chief cities 1142, 1229, 1850, 1578; Michigan, 1218; chief cities 1029, 523, 792, 184; Indiana, 920; chief cities 921, 635, 699, 1892, 1783; Ohio, 1373; chief cities 432, 409, 399, 1921, 509; Kentucky, 997; chief cities 707, 1119, 469, 1343; Minnesota, 1236; chief cities 1661, 1235, 559, 2096; North Dakota, 1358; chief cities 219, 648, 792; South Dakota, 1786; chief cities 1489, 1761; Nebraska, 1314; chief cities 1073, 1381, 1787; Kansas, 988; chief cities 1923, 991, 2082, 1043.

(6) **Plateau States:** New Mexico, 1329; chief cities 1676, 41; Colorado, 428; chief cities 521, 1559, 429, 1041; Wyoming, 2115; chief cities 379, 1030; Montana, 1254; chief cities 858, 296, 799, 66; Arizona, 100; chief cities 1473, 1949, 219, 1544; Utah, 1994; chief cities 1667, 1372; Idaho, 912; chief cities 237; Nevada, 1323; chief cities 342, 2025; California, 308; chief cities 1651, 1671, 1116, 1368; Oregon, 1391; chief cities 1664, 1532, 127; Washington, 2044; chief cities 1380, 1715, 1864, 1800.

(7) **Possessions:** 809; 1415; 1469; 1533; 1669; 848.

(8) **Districts:** 37; 535.

c. Mexico: Territorial Division 1216; chief cities 1213, 808, 1559, 1055; 1256; 1673, 1207, 809, 1868; Principal States 384, 1368, 2010, 2128, 1435; Volcanoes 1528, 1394, 951, 979.

d. Central America: Political Divisions 60, 196, 463, 809, 883, 1347, 1415, 1668; chief cities 1673, 1155.

e. The West Indies: Islands and Groups 2070, 157, 80, 808, 484, 825, 956, 1533, 1048, 1179, 2025, 2094, 1942, 1677; chief cities 847, 1676, 1006.

2. SOUTH AMERICA:

a. **Review of physical geography:** 58.
b. **Brazil:** 261; chief cities 1616, 157, 1453, 1418, 1454, 1677; Rivers 57, 53, 1142, 1501, 1420, 1616, 1393.
c. **Argentina:** 94; chief cities 285, 1030, 95; Rivers, 1501, 1420, 1993; Mountains, 7, 61, 94.
d. **Chile:** 386; chief cities 1676, 2000, 936, 387; Islands 980, 1911, 1428.
e. **Ecuador:** 580; chief cities 1576, 810, 580; Mountains 388, 464.
f. **Peru:** 1456; chief cities 1071, 575, 94, 1457.
g. **Bolivia:** 238; chief cities 1483, 1029, 1538, 239.
h. **Colombia:** 426, 235.
i. **Venezuela:** 2008, 331, 1998.
j. **Guiana:** 811, 752, 1420.
k. **Uruguay:** 1992, 1256, 1993.
l. **Paraguay:** 1419.

3. EUROPE:

a. **Review of physical geography:** 632.
b. **Great Britain and Ireland:** 798, 1707, 2034, 1155, 936, 366; chief cities 1110, 1102, 772, 1156, 219, 1737, 256, 313, 1404, 556, 581, 561, 195; Colonies 24, 918, 1151, 361, 1190, 883, 142, 1873, 1339, 661, 1304, 328, 1937, 1389, 189, 1607, 493, 117, 170, 1753, 196, 2129, 777, 316, 1341, 205, 157, 956, 2094, 1048, 811, 764, 13, 1657, 1153; Places of Greatest Interest 674, 764, 1002, 847, 1734, 1025, 1897.
c. **France:** 703; chief cities 1421, 1128, 1176, 246, 1071, 1928, 1299, 1656, 1637, 848, 1605; Mountains 148, 1566, 2030, 983, 55; Colonial Possessions 24, 49, 1950, 1723, 1843, 496, 716, 1141, 1604, 920, 923, 716, 1324, 2070, 435, 950, 1654, 1724, 1780, 312, 417.
d. **Spain:** 1788; chief cities 1143, 171, 1998, 1729, 1181, 342; Rivers 1865, 808, 546; Colonies 1789, 24, 160, 322. **Portugal:** 1534; chief cities 1079, 1387; Colonies 330, 1535, 73, 149, 427, 1105, 1141, 24, 812, 1549, 1663.
e. **Belgium:** 195, 681; chief cities 279, 81, 763, 1066. **The Netherlands:** 878; chief cities 824, 65, 1637, 1996; Possessions 966, 1846, 247, 1325, 811, 487, 1249, 1850.
f. **Denmark, Norway and Sweden:** 520, 649, 803, 911, 451; 1361, 1687, 1854, 1030; chief cities 395, 202, 1827, 784.
g. **Russia:** 1645; Main Divisions 674, 1512, 1749, 353, 1954, 1001, 237, 1363; chief cities 1661, 1268, 2043, 1371, 1002, 1107, 1615, 2026; Rivers 1349, 565, 1323, 537, 543, 2028.
h. **Germany:** 756; chief cities 204, 829, 264, 1277, 552, 1051, 425, 707, 1365, 835; Main Divisions 183, 1555, 1686, 1756; Colonies 24, 757, 755, 760, 1001, 1325, 219, 339, 1442, 1669; Rivers 502, 1606, 2068, 594, 1371, 2026; Canals 502, 756, 321, 756.
i. **Switzerland:** 1857; Mountains 55, 983, 982, 1189, 1655, 1657; Lakes 2137, 446, 743, 1122; chief cities 2137, 743, 178.
j. **Italy:** 946; chief cities 1300, 1629, 1223, 744, 683, 2009, 1494; Colonies 624, 1780; Volcanoes 2017, 629, 1078.
k. **Austria-Hungary:** 144; Main Divisions 236, 248, 498, 1756; chief cities 2020, 283, 1942, 1542; Mountains 55, 340; Rivers 502, 537, 1247, 2026.
l. **Roumania:** 1643; chief cities 282, 965; **The Balkan Peninsula:** 161; **San Marino:** 1673.

4. ASIA:

a. **Review of physical geography:** 119.
b. **Siberia:** 1749, 987; Rivers 1369, 2123, 943, 1052; railway 1750; chief cities 2026, 938.
c. **Turkestan:** 1954, 1001, 1414, 1873.
d. **Asiatic Turkey:** 1955, 120, 1861; chief cities 447; 1666, 16, 1772, 156, 498, 1940.
e. **Syria:** 1861, 208, 498, 1414; **Palestine** 1411, 729, 766, 970, 1314, 1380.
f. **Arabia:** 87, 1282, 1244.
g. **Persia:** 1455; chief cities 1863, 1880, 946; **Afghanistan** 21; chief cities 986, 987, 866; **Baluchistan,** 164.
h. **India:** 918; main divisions 199, 292, 239, 1563; chief cities 305, 240, 1142, 1123, 1586, 199, 517, 1021, 354; Rivers 924, 735; **Ceylon** 361, 426.

- i. **Indo-China:** 923; Main Divisions 1922, 67, 312, 417, 1029.
- j. **Chinese Empire:** 389; Main Divisions 1157, 1251, 1908; chief cities 1442, 327, 1911, 1734, 834, 1299, 883.
- k. **Korea:** 1011, 1724.
- l. **Japanese Empire:** 960; chief cities 1920, 1396, 1009, 2123, 1006.
- m. **Malay Archipelago:** 1151, 1443; The Philippines 1469; largest islands 1125, 1230; chief city 1158.

5. AFRICA:

- a. **Review of continent as a whole:** 22.
- b. **Egypt:** 590, 1843, 1565; chief cities 304, 45, 1530.
- c. **North Africa:** Tripoli 1943; 658; Algeria, 49, 50, 1388; Tunis, 1950, 1951; Morocco, 1263, 658, 1264, 1869.
- d. **Congo Free State:** 441.
- e. **British South Africa:** 328.
    - (1) **Cape Colony:** 328; cities 330, 1530, 1002; mountains and promontories 329; rivers 1389, 1937.
    - (2) **Orange River Colony:** 1389; cities 228, 1389.
    - (3) **Natal:** 1304; cities 563, 1304, 1305.
    - (4) **Transvaal:** 1937; cities 1546, 973.
    - (5) **Other dependencies:** 180, 189, 1607.
- f. **German:** 755, 24; French, 716, 717, 1843, 24; Portuguese, 1535, 1305, 2128, 24.

    See also German, French, Portuguese, Italian, Spanish and Turkish colonies above.

6. AUSTRALASIA:

- a. **Australia:** 142, 745, 1331, 2018, 2069.
    - (1) **Queensland:** 1574, 144; cities 268, 144.
    - (2) **New South Wales:** 1331, 143; cities 1858, 1331; rivers 504, 1282, 1331.
    - (3) **Victoria:** 2018, 143; chief city 1200.
    - (4) **South Australia:** 144.
    - (5) **Western Australia:** 2069, 144.
- b. **Tasmania:** 1873, 718, 1339.
- c. **New Zealand:** 1339, 449, 1522; geysers 762; cities 2067, 1340.

THE CHARTS OF HISTORY.

Note: The charts beginning opposite page 877, Vol. II, of *THE NEW STUDENT'S REFERENCE WORK* should be consulted. They supplement *The Outlines of History* by giving their subject-matter in the order of time and in parallel columns.

In these charts the landmarks of the world's history are presented by centuries. Contemporary nations are ranged side by side, each designated by a separate color, and the chief events in the history of each nation are recorded with the proper date. The contemporary events of a century are taken in at a glance, and thus the eye is brought to the aid of the mind in grasping the whole current of history. The wonderful efficiency of this method a brief study will demonstrate. It is to history what maps are to geography.

> "Sounds which address the ear are lost and die
> In one short hour; but that which strikes the eye
> Lives long upon the mind; the faithful sight
> Engraves the knowledge with a beam of light."

EXPLANATION.

The date of each century is given in heavy figures in the left margin. In Chart I note that the blue on the left represents the Hebrew nation. Going down these columns, we get the progressive history of each nation. For instance, we trace the history of the Hebrew nation from the time of Noah down to the period when, in 975 B.C., the one nation became two through the revolt of the Ten Tribes. This change is marked by a change of color under the headings Judah and Israel, and then we have the two nations instead of one. In like manner we have the history of Egypt and Greece. On the other hand, looking across the page we get the contemporary history of each century. We find that Joash in Judah, Elijah and Elisha in Israel, lived in the same century with Homer the Greek poet. In the next chart we see that in 721 B.C. the Assyrian empire, which had come into power, carried the Ten Tribes captive. So the color disappears, and its place is occupied by the color representing Assyria. We see that about 700 B.C. the Assyrian empire was overthrown and succeeded by the Babylonian empire; and later the Jews were wiped out, being carried captive to Babylon. So, by looking down this column, we get the complete history of these nations. In the same way we get the continuous history of Greece, and, in the last column, Rome. Looking across the page, we see that Hezekiah and Isaiah in Judah, the captivity of the Ten Tribes and the Epoch of the Olympiads, from which the Greeks reckoned time as we do from the time of Christ, and the founding of Rome were contemporary in the eighth century B.C. In like manner we see that the captivity of the Jews, the period of the seven wise men of Greece etc. occurred in the same century. In the next century we see that Xerxes, the mighty ruler, Ezra, Nehemiah and Malachi, the last of the Old Testament writers, were contemporary with Socrates and the Laws of the Twelve Tables, being the first time that the celebrated Roman laws were reduced to writing. Passing to later history, the next page shows the history of England, France, Germany and other nations of the world down to the sixteenth century. Looking from the top to the bottom of the first column, we will trace the history of England through these centuries. We see that the Danish kings were succeeded by the Norman kings; that the House of Plantagenet ran until 1399, when the House of Lancaster came into power, and was succeeded by the House of York and then by the House of Tudor. And so of each of the other nations. Looking across, as before, we get the contemporary history of each century.

The first six charts cover general history. We have five more which are given especially to the history of the United States and one on Canadian history. Chart VII is the colonial chart. The first thing that will attract your attention is the fact that Virginia was the oldest colony, as shown by the position of the color representing Virginia on the page. The next was New York, and the third was Massachusetts. These were the great mother colonies. We also notice that Maryland and North Carolina were originally a part of Virginia and were separated from it. So New Jersey and Delaware were part of New York; Connecticut, Rhode Island and New Hampshire were originally part of Massachusetts; South Carolina, Pennsylvania and Georgia were originally settled on the dates given. Looking across, at the top, we see that the first settlement was at Jamestown in 1607; the next on Manhattan Island by the Dutch, in 1614; and the third by the Puritans, in 1620. Looking down the column, we see that tobacco was first introduced in 1615; slavery, 1619; cotton, 1621, etc. Passing down into the next century, we have the chief events of the Revolutionary War. Then follows a chart on the history of the United States after the adoption of the Constitution. Few persons can give, in their proper order, the names of the Presidents of the United States, and tell which had one term and which two. Here they are given in a very striking way: Washington, two; Jefferson, two; Madison, two, and so on. Wherever there are two terms, the different administrations are separated by a line and the chief events of each administration are recorded. On the right we have the events which occurred in the Old World. In like manner Chart XII gives us a complete, progressive history of Canada. We thus show how simple and effective these charts are. If we think of New York, involuntarily the map is before our eye and we see just where New York stands on the coast. We see Chicago as it stands at the head of Lake Michigan. We see all the other prominent cities of the country and know just how they stand in relation to each other. We learn the positions easily and readily. How? By a study of the map. In this way geographical positions are learned easily even by young children. It is because through the eye there is photographed on the mind the position of different places to each other. Now these charts in like manner locate events. They are made very simple by placing only the landmarks of history. Heretofore, charts have defeated the very object for which they were intended, by putting on so many events that the eye was confused and burdened. Here we give only the landmarks, and in this way the trouble and confusion of studying history are forever done away with. The test of use has proved that this is the most effective method of aiding either old or young to clearly understand and remember the facts of history in their proper order, and especially to fix in the mind the contemporary events of any given century.

HISTORY

I. THE ANCIENT EGYPTIANS.

1. LOCATION OF THEIR COUNTRY: 590.

2. THE BEGINNING OF THEIR HISTORY: 591.

3. THE FOURTH DYNASTY AND ITS ACHIEVEMENTS: 591; 1368.
- **a. Date of its control:** 591.
- **b. Cheops and the building of the Pyramids:** 1565; **Sphinx** 1797; **Sesostris** 1727; Isis 945; Heliopolis 859.
- **c. The city of Memphis:** 1201.

4. THE HYKSOS KINGS: 906; 979.
- **a. Their final overthrow:** 591.

5. THE PHARAOHS: 1464; 1585; 1269.
- **a. The city of Thebes:** 1898; Ramession 1585; Temples of Karnak and Luxor 1887; Memnon 1201.

6. THOTMES III AND THE EMPIRE OF EGYPT: 591; 629; 313; 1521; Shishak 1746; Cambyses 313; Petrie 1462; Atlantis 133; Lepsius 1057; archæology 91.

7. INDUSTRY OF THE PEOPLE:
- **a. Agriculture the chief industry:** 26; 940; 46.
- **b. Metal and leather working, making of linen, brick, glass:** 1043; 1076; 265; 2005; 773.

8. SCIENCE AND ART: 591; 668.
- **a. Astronomy:** 750; Ptolemy 1558; astrology 127; geometry (Euclid) 631; algebra 48; architecture 92; literature 1082; Alexandrian Library 46; sculpture 1711; Karnak 1887; Luxor 1888; medicine (Hippocrates) 875; geography 745.
- **b. The use of hieroglyphics:** Rosetta Stone 1635; writing 2113; pen 1443.
- **c. The use of papyrus:** 1418; 1417.
- **d. Embalming:** mummy 1276; pyramids 1565; catacombs 348.
- **e. The mechanical tools invented and used:** 591.

9. THE RELIGION OF THE PEOPLE: races and religions 590; mythology 1296; Serapis 1725; scarabæus 1687; Ammon 64; oracle 1387.

II. THE BABYLONIANS, ASSYRIANS AND PERSIANS.

GENERAL REFERENCES:

Susa 1852; Ecbatana 578; Nineveh 1352; Nippur 1352; Persopolis 1454; Ispahan 946; Bagdad 156.

1. LOCATION: Babylonia 152; Assyria 125; Persia 1455; The Medes 1197; Mesopotamia 1210.

2. THE PEOPLE: 152; Semites 1722; Aryans 116; Iranians 936; Semiramis 1722.

3. THEIR ARTS: Assyrian art 668; architecture 93; archæology 91; Seven Wonders 1727; libraries 1063; brick 265; cuneiform 486; Shiraz 1746; book 243.

4. THEIR WARS AND CONQUESTS: Cyrus 498; Cambyses 313; Darius 503; Xerxes 2118; Crœsus 480; Lydia 1126; fortification 700; Sardanapalus 1679; Sardis 1680; Salamis 1664; Marathon 1167; Greece 801; Jerusalem 970; Jews 972.

5. THEIR RELIGION: Zoroaster 2136; Darius 504; Magi 1144; Parsis 1426; Persian literature 1081; oracle 1387.

III. THE HEBREWS.

1. **THE ORIGIN OF THE PEOPLE:** Palestine 1411; Semites 1722; Jews 971; Syria 1862; Abraham 4; Ur 1991; Moses 1269; Nebo 1314; Jacob 955; Josephus 979.
2. **THE WANDERING:** 971; Egypt 591; Joshua 979.
2. **THE CAPTIVITY:** Cyrus 493; Babylonia 153; Nebuchadrezzar 1315; Esther 627.
4. **THE WORK OF THE PROPHETS:** Jeremiah 969; Job 973; Isaiah 944; Daniel 501; Samuel 1670; Elias 605; Ezekiel 644; Maccabees 1130; Habakkuk 820.
5. **SAUL THE FIRST KING:** 1683; Philistines 1470.
6. **DAVID THE HERO OF THE JEWS:** 506; Jews 972; Assyria 125; armor 105.
7. **SOLOMON THE ORGANIZER OF THE GOVERNMENT:** 1779; 1963.
8. **THEIR LITERATURE:** Bible 209; literature 1081; calendar 306.
9. **THE DIVISION OF THE KINGDOM:** Palestine 1411; Samaria 1669; Jews 972.

See, also, Charts I and II.

IV. THE PHŒNICIANS.

1. **THE LAND OF PHŒNICIA:** 1473; 1722; 1862; 302.
2. **LOCATION OF TYRE AND SIDON:** 1963; 1753; 1862.
3. **AS MERCHANTS, TRADERS AND SEAMEN:** 1753; 1963; 745.
4. **THEIR ARTS AND PRODUCTS:** 1753; 1722; 2113.
5. **COLONIES ON THE MEDITERRANEAN COASTS:** 1473; Carthage 343; Sicily 1751; Cyprus 493; Thebes 1899; Utica 1995; Malta 1153; Spain 1788.

V. HISTORY OF THE GREEKS.

1. **THE EARLIEST GREEKS:** Greece 801; Pelasgians 1442; Argos 96; Tiryns 1915; Aryans 116; Crete 477; Epirus 622.
    - a. **The migration into Greece:** 801; 545.
    - b. **What Homer tells of them:** 882; Argonauts 95; Cassandra 346; Ulysses 1965; Troy 1945; Helen 858; Achilles 7; Paris 1422; Agamemnon 25; Arion 96; Orestes 1392; Æneas 17.
2. **GREEK COLONIZATION:** Colony 427; Corinth 455; Sicily 1751; Syracuse 1861; Dorians 545; Smyrna 1772; Cyprus 493; Eubœa 630.
3. **SPARTA:** 801; 1792; 26.
    - a. **The three classes of citizens:** 1792; 1453; 578.
    - b. **The institutions and laws of Lycurgus:** 1125; 1792.
4. **ATHENS:** 130; Attica 134; Greece 801; Bœotia 233; Aristides 97.
    - a. **The laws of Draco:** 547; 1779.
    - b. **Solon the lawgiver of Athens:** 1779; 94; 480.
    - c. **The oracles and the Olympian games:** 1387; 1381; Pythian games 1568; Delos 518; Milo 1228.
5. **THE WARS WITH PERSIA:** Darius 504; Xenophon 2117; armor 105; trireme 1943.
    - a. **Battle of Marathon:** 1167; Miltiades 1228; Aristides 97; Plataea 1502; Cimon 399.
    - b. **Battle of Thermopylæ:** 1901; 1056.
    - c. **Salamis and Platæa:** 1664; 1502; 1899.
6. **REBUILDING OF ATHENS:** 130.

- 7. **THE AGE OF PERICLES:** 1452; 399.
    - a. **Building of the Long Walls:** 130.
    - b. **Relations with Sparta:** 1453.
    - c. **The Confederacy of Delos:** 518.
    - d. **Art, Literature and Religion:** Art 669; Seven Wonders 1727; Apelles 82; Æsop, Æschylus Æsculapius 21; Diana 527; Pluto 1507; vases 2005; Parthenon 1426; literature 1082; Homer 882; Herodotus 868; philosophy 1472; philology 1471; libraries 1063; astronomy 127; theatre 1898; œdipus 372; drama 550; calendar 306; Euripides 632; Anaxagoras 69.
    - e. **Famous men:** Pericles 1452; Herodotus 868; Phidias 1465; Socrates 1777; hemlock 860; Epicurus 621; Pythagoras 1567; Thucydides 1908; Diogenes 533; Aristides 97; Pisistratus 1441; Aristotle, Aristophanes 97; Plato 1502; Euclid 631; Pindar 1491; Alcibiades 41; Theophrastus 1900.
- 8. **THE PELOPONNESIAN WAR:** Peloponnesus 1443; Corinth 455; Pericles 1453; Bœotia 233; trireme 1943; Arcadia 90; Thucydides 1908; Nicias 1348.
    - a. **The victory of Sparta:** 1792; 620; 41.
- 9. **RISE OF MACEDON AND ITS CONQUEST OF GREECE:** 1135; 1468; 1906.
    - a. **Opposition of Demosthenes:** 519.
- 10. **THE EMPIRE OF ALEXANDER:** 44; Greece 801; Egypt 591; Diogenes 533. See, also, Chart III.
    - a. **Conquest of Persia:** 455; 1899.
    - b. **Alexander made emperor of Persia:** 44.

VI. HISTORY OF THE ROMANS.

- 1. **ROME:**
    - a. **Early history of the Romans:** 1626; Etruria 630; Veii 2007; pottery 1539; Pompeii 1524.
    - b. **The founding of the city:** 1629; 1631.
    - c. **Stories of the kings:** Numa Pompilius 1365; Sabines 1651; Tarquin 1872; Horatius 885.
- 2. **ROME AS A REPUBLIC:** 1627.
    - a. **The plebians and what they wanted:** 1941.
    - b. **Cincinnatus:** 400.
    - c. **Works of the kings and emperors:** 1629; Tarquin 1872; circus 401; Janus 960.
- 3. **ROME AND CARTHAGE:**
    - a. **Carthage and its people:** 342; 1995.
    - b. **Rome and Carthage compared:** 342.
    - c. **The Punic Wars:** 343; 1562; Utica 1995; Hannibal 834; Hamilcar 830; Hasdrubal 846; Trasimenus 1939; Cannæ 323; Sicily 1751; Scipio 1706; Numidia 1365; Zama 2128.
    - d. **The destruction of Carthage:** 343; Scipio 1707.
- 4. **CONQUEST OF MACEDONIA AND GREECE:** Roman Empire 1627; Macedonia 1135; Corinth 455; Polybius 1521.
- 5. **CIVIL WAR IN ROME:** 1627.
    - a. **The Gracchi:** 788.
    - b. **Mærius and Sulla:** 1172; 1845; Mithridates 1243.
    - c. **Caesar and Pompey:** 303; 1524; Lepidus 1056; triumvirate 1943; Rubicon 1641; Sparta 1792; France 704; Helvetii 860; Catiline 251.
- 6. **ROME AS AN EMPIRE:**
    - a. **Work of Julius Cæsar:** 303; calendar 306; libraries 1063; Cleopatra 408; Antony 81; Brutus 280; literature 1083.
    - b. **The reign of Augustus:** 137; 1627; Actium 9; Antony 81; Lepidus 1056; Prætorian Guard, 1542; Arminius 105; German empire 758.
    - c. **The reigns of Trajan, Hadrian and Marcus Aurelius:** 1627; Trajan 1934; York 2123; Hadrian 822; Aurelius 139.
    - d. **The division of the empire:** 1627; Diocletian 533; Constantine 447.
    - e. **The downfall of Rome:** 1627.

VII. HISTORY OF WESTERN EUROPE.

(I) FALL OF ROME TO PROTESTANT REVOLUTION:

1. **THE BARBARIANS:** Europe 634; Helvetii 860; Alemanni 43; Germans 758; Vandals 2002; Huns 898; Attila 134; Alaric 37; Goths 784; Dacia 495; Genseric 744.
    - a. **Their character:** Sarmatians 1681; Scythians 1712; Slavs 1766.
    - b. **Their invasions of the Roman empire:** Teutones 1895; Cimbri 399; Marius 1172; Lombards 1109; Genseric 744; Alemanni 43; Aurelius 139.
2. **CHARLEMAGNE:**
    - a. **His predecessors — Charles Martel and Pepin the Short:** Merovingians 1208; Carlovingians 335; Martel 371; Poitiers 1512; Pepin 1450.
    - b. **The extent of his empire:** 368; Europe 634; Saxons 1685; Lombards 1109; France 704.
    - c. **Coronation at Rome:** 1054.
    - d. **His work in civilizing and educating the people:** 368; States General 1813; guilds 811; Alcuin 42; Eginhard 589.
3. **CHRISTIANITY:** The Virgin Mary 1180; Peter 1461; Paul 1431; Stephen 1822; Barnabas 172; Cyprus 493; Antioch 81; catacombs 348; Diocletian 533; Constantine 447; Roman Empire 1627; Ambrose 58; Augustine 137; Julian the Apostate 981; Photius 1475; Lateran 1034; Jerome 970; The Vulgate 2030; Leo III 1054; Gregory 804; Patrick 1429; 937; Saint Nicholas 1348.
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    - e. **Church Councils:** 396; pope 1527; reformation 1598.
    - f. **Universities:** 1987; Bonn 243; Heidelberg 858; Sorbonne 1782; Bologna 239; Montpellier 1258; Salamanca 1664; Louvain 1120; Prague 1542.
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        - (2) **Primitive people:** 116.
    - b. **Roman Britain:**
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        - (2) **Roman roads and fortifications in Britain:** Agricola 26; Hadrian 822; Severus 1728; London 1111.
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    - a. **Angles and Saxons as conquerors of Britain:** Saxons 1685; Wales 2034; Jutland 984; Arthur 114; Edward the Confessor 585; heptarchy 866; jury 983.

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3. **THE DANISH CONQUEST:** Denmark 520; Canute 327; Dunstan 562.
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5. **RISE OF THE ENGLISH NATION:** 588.
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   b. **Reign of King John:**
      (1) **Magna Charta:** 1145; 616; 586.
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   c. **Reign of Edward I:**
      (1) **New taxation for the new monarchy:** 586.
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      (1) **Beginning of Hundred Years' War with France:** Edward III 586; Crécy 476; Calais 305; Poitiers 1512.
   e. **Reign of Richard II:** 1611; Henry IV 862; John of Gaunt 974; Wat Tyler 2050.
6. **DESTRUCTION OF FEUDALISM:** 862.
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- **f. Reign of Anne:** 75; Stuarts 1836; Marlborough 1173; Bolingbroke 238.
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- (5) **The attempt to drive the Confederates from the Mississippi:** Farragut, 649; Vicksburg, 2018; Baton Rouge, 182.
- (6) **Grant's campaign in the West:** 793; Chattanooga, 373; Missionary Ridge, 1239; Ft. Donelson, 697; Shiloh, 1742; Burnside, 294; Foote, 692.
- (7) **The battle of Gettysburg; end of the Confederate invasion:** 762.
- (8) **The Virginia campaign of 1864:** Spottsylvania, 1804; Cold Harbor, 421.
- (9) **The heroic struggle of Lee and the persistent attacks of Grant:** 1047, 694.
- (10) **Sherman's invasion of the cotton states — the March to the Sea:** 1741; Johnson, 976; Yazoo, 2121; Nashville, 1304.
- (11) **Surrender of Lee at Appomattox:** 86; Lee, 1048; Grant, 794.
- (12) **The assassination of Lincoln:** 245; 1075.
- (13) **Reconstruction in the South:** 1594.

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6. CANADA FROM TREATY OF PARIS TO THE PRESENT:

a. English Period:

- (1) **Rebellion of American Colonies:** American Revolution 1978.
- (2) **Treaty of Versailles:** Canadian Southern boundary established 2015.
- (3) **War of 1812:** 1978.
  - (a) **Surrender of Detroit:** 524.
  - (b) **Battle of Lake Erie:** 1454.
  - (c) **Battle of Lundy's Lane:** 1224; 555.
- (4) **Fenian invasion:** 654.
- (5) **Confederation formed:** British North America Act 320.

b. Period of the Dominion:

- (1) **Component Provinces:** 1383; 1571; 1362; 1324.
- (2) **Red River Rebellion:** 1596; 1613.
- (3) **Manitoba Admitted:** 1159.
- (4) **British Columbia Admitted:** 320.
- (5) **Prince Edward Island Admitted:** 320.
- (6) **Canadian Pacific Railway:** 320.
- (7) **Districts of Ungava, Franklin and Mackenzie Absorbed:** 317.
- (8) **Grand Trunk Pacific Railroad projected:** 792.
- (9) **Earl Grey Appointed Governor General:** 805.
- (10) **Provinces of Alberta and Saskatchewan created:** 320.
- (11) **Manitoba, Ontario, Quebec and Northwest Territories enlarged:** 317
- (12) **Duke of Connaught Appointed Governor General:** 443.

CIVIL GOVERNMENT

GOVERNMENT

Definition: Old classification, Monarchy, Aristocracy and Democracy.

Modern and more valuable classification.

Difference between presidential systems, as that of United States, and parliamentary systems, as that of England.

State government in the United States; county government; township government; city government; school districts, 787.

GOVERNMENT OF UNITED STATES

The nation a federal republic, powers defined by the national constitution.

Each state a representative republic, without sovereignty and without any relation to any foreign power.

Federal government administered by the executive, legislative and judicial departments, 1973, 1974.

Executive power and duties vested in the president and administered through departments of state, treasury, war, navy, postoffice, interior, justice, agriculture, and commerce and labor. Organization and scope of these departments, 1984, 1985.

Legislative authority, vested in Congress, consisting of senate and house of representatives. Members of each house and how chosen, 1974, 442, 443.

Powers and duties of each house, course of legislation, 442.

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State Governments: Representative republics without sovereignty and without any relation to any foreign power. Powers are those not delegated to Federal government and are derived from citizens of state. States determine suffrage and control elections, criminal and civil law, property and civil relations, source of revenue, local government, 1974.

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National Municipal League, measures advocated; initiative and referendum, 1279.

Municipal government in foreign cities, 1279.

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District courts and their functions; relation of subordinate courts to the supreme court, and of Federal to state courts, 467.

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CIVIL SERVICE

Executive branch of government: English civil service separated into departments. Divisions of civil service in the United States. Number of positions in United States civil service. Civil service commissioners, their powers and duties; merit system; competitive examinations, how conducted; classes of service open to competitive appointment, 402, 403.

TARIFF

First tariff in United States: Statement of successive acts, their character and effects, 1871.

POLITICAL ECONOMY

Definition: Science relating to the production, distribution and exchange of wealth. First systematic exposition by Adam Smith; details of his theory, its defects; changes which have taken place and their causes. Relation of political economy to ethics. High or low tariff a leading issue in United States, 1517, 1518.

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TAXES

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Monroe Doctrine, 1253, 1980.

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2. **FICTION:** legend 1049; mythology 1294; novel 1363; romance 1628.
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- 2. **POETRY:** 1081.
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  - b. **Omar Khayyam and The Rubaiyat:** 1382.
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- 3. **PROSE:** 1081.
  - a. **The Zend-Avesta of Zoroaster and the Parsis:** 2136; 1426; Magi 1144; Medes 1197.

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- 1. **THE BIBLE:** 209; Daniel 501; David 507; Deborah 512; Elijah 605; Elisha 606; Esther 627; Ezekiel and Ezra 644; Habakkuk 820; Hosea 887; Isaiah 944; Jeremiah 969; Jews 971; Joshua 971; Maccabees 1130; Moses 1269; Nahum 1298; Nehemiah 1319; Ruth 1649; Samuel 1670; Saul 1683; Solomon 1779; The Vulgate 2030; Zechariah 2130; Barnabas 172; James 956; John 975; Luke 1123; Mark 1173; Matthew 1189; Paul 1430; Peter 1461.
- 2. **THE TALMUD:** 1081; Pharisees 1464; Scribes 1711.
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- 1. **ITS CONTENTS:** 1082; Egypt 591; book 243; Rosetta stone 1635.
- 2. **THE BOOK OF THE DEAD:** 1082.
- 3. **PENTAUR:** 1082; Rameses 1585.

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- 1. **POETRY:** 1082; 1510.
  - a. **Epics:** Homer and The Iliad and The Odyssey 832, 882, 1762, 1945; Hesiod 870.
  - b. **Drama:** 1082; 1510; 550; 1372; Æschylus 20, 1082; Aristophanes 97; Euripides 632; Menander 1082, 550; Sophocles 1781, 1082.
  - c. **Lyrics:** Arion 96; Pindar 1491; Sappho 1678; Simonides 1759, 130.
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- 2. **PROSE:** 1082.
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  - b. **Philosophy:** 1472; 1082; Pythagoras 1567; Socrates 1777, 2117 (Xantippe); Plato 1502; Aristotle 97, 1084; Theophrastus 1900; Epicurus 621; Zeno 2131; Stoics 1830; Epictetus 621.
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- 1. **POETRY:** 1509.
  - a. **Epics:** Ennius 1083; Lucretius 1123, 1083; Vergil 2011, 1083. See, also Aeneas 17; Troy 1945 and Venus 2010.
  - b. **Drama:** 550; Andronicus 1083; Plautus 1503, 1083; Terence 1891, 1083.
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  - d. **Satire:** Lucilius 1083; Juvenal 984, 1083.
  - e. **Elegiac Poetry:** Ovid 1402, 1083.

- **2. PROSE:** Augustus 138; Phædrus 1463.
  - a. **History:** 1083; Cæsar 303; Livy 1104; Sallust 1666; Tacitus 1863.
  - b. **Oratory:** 1083; Cicero 398; Quintilian 1576.
  - c. **Essays and Letters:** 626, 1058; Cato 351, 352; Cicero 398; Pliny the Younger 1505; Seneca 1723.
  - d. **Science and Law:** Pliny the Older 1505; Tribonian 984 (Justinian) and 1038 (Law); Varro 2004.
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- 4. **AVERRŒS:** 1084.
- 5. **MASUDI:** The Golden Meadows 1084.
- 6. **AZEDDIN:** The Birds and the Flowers 1084.
- 7. **ARABIAN NIGHTS' ENTERTAINMENTS:** 1084.

XIV. ITALIAN.

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  - c. **Drama:** Alfieri 47, 1084; Leopardi 1056, 1084.
- 2. **PROSE:**
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  - b. **Politics, History and Biography:** 1084; Machiavelli 1136; Mazzini 1193; Cellini 357; Vasari 2004.
  - c. **Science:** 1706; Galileo 730; Bruno 279; Galvani 731; Volta 2028; Marco Polo 1521.

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- 1. **THE MEDIEVAL PERIOD:** 1086; romance 1628.
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- 2. **THE MODERN PERIOD:**
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    - a. **Epic:** Bilderdijk 1086.
    - b. **Drama:** Goes 1086; Schimmel 1086; Vondel 1086.
    - c. **Didactic:** Cats 1086; Helmer 1086.
2. **PROSE:**
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    - b. **History:** Hooft 1086.
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    - d. **Science and Law:** Boerhaave 234; Grotius 1086 and 1058 (Law); Huygens 902.
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    - b. **Prose:** Andersen 69; Brandes 260.
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    - b. **Prose:** Björnson 221; Edda 581, 1087; Garborg 1087; Lie 1087; Nansen 1299.
4. **SWEDISH:**
    - a. **Poetry:** Atterbohm 1087; Bellman 1087; Borgesson 1087; Franzen 1087; King Oscar II 1396; Runeberg 1643; Stagnelius 1087; Stjernhjelm 1087.
    - b. **Prose:** Bremer 263; Carlen 1087; Geiger 742; Linné 1077; Rydberg 1087; Nordenskjöld 1354; Schwartz 1087; Swedenborg 1855.

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    - c. **Das Nibelungen Lied ("The Lay of the Nibelungs"):** 1347; 1987; Wagner 2032; Goetterdaemmerung 785; Rheingold 1606; Sigurd 1756; Valhalla 1999, 2035.
    - d. **Birth of German drama in mystery and passion-plays:** Miracle-Plays 1238; Oberammergau 1368; 1087; Reynard the Fox 1604.
    - e. **The language:** German 759; Platt-Deutsch 1503.
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    - b. **Poetry:**
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        - (3) **Lyric:** Gerhardt 755; Heine 858; Lorelei 1115; Uhland 1964; Wieland 2082.

- c. **Prose:**
  - (1) **Fiction:** 1088; legend 1048; novel 1363; mythology 1294; romance 1628; Auerbach 136; Ebers 577; Freitag 718; Grimm 806; Munchausen 1277; Reuter 1604; Platt-Deutsch 1503.
  - (2) **Belles-Lettres: (Criticisms, Essays, Humor):** 1088; Lessing 1058; Richter 1612; Schiegel 1689.
  - (3) **History:** 1088; Baur 183; Curtius 489; Doellinger 541; Mommsen 1249; Niebuhr 1349; Strauss 1836.
  - (4) **Philosophy:** 1087; 1472; Kant 992; Fichte 659; Schelling 1688; Herbart 866; Hegel 857; Schopenhauer 1704; Lotze 1116; Leibniz 1050.
  - (5) **Science:** 1088; Bunsen 289; Haeckel 822; Helmholtz 860; Hertz 870; Humboldt 890; Lassalle 1033; Liebig 1066; Marx 1180; Ritter 1617; Roentgen 1624; Schliemann 1689; Vogt 2026; Weissmann 2065.
  - (6) **Theology:** Herder 867; Ritschl 1617; Schleiermacher 1689.

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   - a. **Earliest Poetry:** Roland 1625; Provencal 1554.
   - b. **The Troubadours:** 1944, 1085.
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   - a. **Poetry:**
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     - (2) **Lyric:** Béranger 201; Hugo 895; Lamartine 1023; Leconte de Lisle 1045; Musset 1292; Marseillaise 1176.
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     - (1) **Fiction:** Margaret of Navarre 1170; La Fontaine 1021; Le-Sage 1057; Perrault 1454; Mother Goose 1270; Saint-Pierre 1662; Daudet 506; Dumas 560; Hugo 895; 1999 Valjean; Sand 1673; Sue 1843; Verne 2014; Vigny 1085; Balzac 165; Bourget 252; Gautier 741; Maupassant 1085; Zola 2133.
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     - (3) **History and Biography:** D'Aubigne 505; Blanc 226; Guizot 813; Michelet 1218; Napoleon III 1902; Renan 1601; Rollin 1625; Thierry 1085; Thiers 1902; Tocqueville 1919; Voltaire 2029.
     - (4) **Philosophy:** 1472; 1085; Descartes 522; Cousin 468; Comte 438; science 1706.
     - (5) **Science (including, also, economics, education and law):** Descartes 522; Pascal 1427; Montesquieu 1256; Hennepin 862; Rousseau 1638; interest 931; D'Alembert 497; Diderot 530; encyclopedia 614; Buffon 286; Cuvier 491; Bastiat 179; Flammarion 680; Fourier 702; Laboulaye 1016; Laplace 1030; Lavoisier 1037; Lenormant 1053; Legendre 1049; Leverrier 1060; Mascart 1183; Pasteur 1427; Réclus 1594; Saint-Hilaire 1657; Saint-Simon 1662.
     - (6) **Theology:** 1085; Calvin 311; Fénelon 654; Massillon 1187; Pascal 1427; Chateaubriand 372.

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2. **POETRY:**
    - a. **King Arthur, the Holy Grail and the Table Round:** Arthur 114; Grail 790; Idyls of the King 913; Round Table 1638; Tennyson 1891; Bellicent 198; Camelot 314; Excalibur 640; Galahad 729; Ivaine 949; Launfal 1035; Lohengrin 1109; Merlin 1207; Parsifal 2033; Tristram 1943.
    - b. **Ossian:** 1397.

3. **MYTHOLOGY:** 1294; Druids 554; Fairy 646; Fenians 654; Mab 1129; Madoc 1142; Puck 1559.

4. **CELTS:** 357; legend 1049; romance 1628.

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    - b. **Wiclif:** 2114; 1088; Bible 210; Vulgate 2030.

3. **THE FIFTEENTH CENTURY:** 1088; Malory 1152; Round Table 1638; Caxton 354.

4. **THE SIXTEENTH CENTURY—RENASCENCE AND ELIZABETHAN AGE:**
    - a. **General References:** 1088-9; drama 550; Elizabeth 611; Bible 210; Coverdale 469; Tindale 1915; essay 626; poetry 1509; sonnet 1781.
    - b. **Birth of English Drama:** 1089; Marlowe 1174; Shakespeare 1733.
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        - (2) **Shakespeare:** 1733; 1089; sonnet 1781; *As you Like It* 129; *Hamlet* 831; *King Lear* 1004; *Macbeth* 1130; *Merchant of Venice* 1206; *Midsummer Night's Dream* 1222; *Othello* 1399; Portia 1531; *Romeo and Juliet* 1630; *The Tempest* 1886; *The Winter's Tale* 2097; Stratford-on-Avon 1836.
        - (3) **Other Poets:** Beaumont 187; Daniel 1088; Drayton 1088; Fletcher 1089; Greene 1089; Jonson 978, 1089; Peele 1089; Surrey 1851; Sackville 1088; Sidney 1752; Watson 1089, 2055; Wyatt 2114.
    - d. **Prose:** Ascham 117; Bacon 154; essay 626; 1089; philosophy 1472; W. Gilbert 766; Hakluyt 825; Hooker 884; Knox 1008; Lyly 1089; Thomas More 1261; 1088; *Utopia* 1996; Raleigh 1583; Sidney 1752; Tindale 1915.

5. **THE SEVENTEENTH CENTURY:**
    - a. **Poetry:** 1089; poetry 1509; sonnet 1781; Milton 1228; *Comus* 438; *Paradise Lost* 1418; Puritans 1564; Dryden 555; Cowley 469; Herbert 867; Lovelace 1089; Waller 1089.
    - b. **Prose:**
        - (1) **General References:** 1089; legend 1048; novel 1363; philosophy 1471; romance 1628; science 1706.
        - (2) **Authors:** Baxter 184; Bunyan 290; *Pilgrim's Progress* 1490; Clarendon 404; Hobbes 1089; Leighton 1051; Locke 1106; Newton 1344; Penn 1446; Pepys 1451; Jeremy Taylor 1876; Walton 2040.

6. **THE EIGHTEENTH CENTURY (the Queen Anne Age and the Georgian Era):**
    - a. **Poetry:** Pope 1527; Akenside 35; Burns 293; Collins 425; Cowper 470; Gay 741; Goldsmith 778; *Vicar of Wakefield* 2018; Johnson 976;

Hannah More 1261; Ossian 1397; Sheridan 1740; Thomson 1906; Toplady 1924; Watts 2057; Charles Wesley 2068; Young 2125.

b. Prose:

- (1) **Essays:** 626; 1090; Addison 12; Coverley 469; Steele 1820.
- (2) **Fiction:** 1090; novel 1363; romance 1628; Defoe 515; Fielding 660; Richardson 1611; Smollet 1772; Sterne 1824; Swift 1856; Brobdingnag 272; Lilliput 1071.
- (3) **History:** 1090; 876; Gibbon 764; Hume 897; Robertson 1090.
- (4) **Letters:** 1058; Chesterfield 378; Junius 982; Lady Montague 1254; Walpole 2038.
- (5) **Oratory:** Burke 291; Chatham 1495; Curran 487: Erskine 625.
- (6) **Philosophy, Religion and Science:** 1090; Berkeley 203; Blackstone 223; Butler 1090; Doddridge 537; Paine 1409; Reid 1599; Adam Smith 1769.

7. THE NINETEENTH CENTURY: 1090-2:

a. Poetry: 1090; Austin 141; Wm. Blake 226; Browning 276; Buchanan 282; Byron 298; Campbell 316; Coleridge 429; *Ancient Mariner* 69; Crabbe 472; Hood 884; Aram 89; Heber 857; Hemans 860; Hunt 899; Keats 994; Keble 994; Landor 1025; Lytton 1128; Matthew Arnold 110; Marston 1177; Moore 1260; *Last Rose of Summer* 1033; Morris 1265; Edwin Arnold 110; Patmore 1429; Procter 1551; Rogers 1624; Rosetti 1635; Scott 1709; *Lady of the Lake* 1020; *Lay of the Last Minstrel* 1040; Lochinvar 1105; Marmion 1174; Rob Roy 1620; Shaw 1735; Shelley 1738; Cenci 358; Sladen 1765; Southey 1787; Madoc 1142; Swinburne 1856; Tennyson 1891; *Grail* 790; *Idyls* 913; *Merlin* 1207; *The Princess* 1548; *Round Table* 1638; Tupper 1952; William Watson 2055; Kirke White 2078; Charles Wolfe 2103.

b. Prose:

- (1) **Fiction:** 1091-2; Aguilar 33; Austen 141; Barrie 175; Bayley 1125 *(Lyall);* Besant 207; Black 221; Blackmore 223; Boothby 246; Bronte 272; Dr. Brown 275; *Marjorie Fleming* 1152; T. A. Browne 276; Bulwer 288; Caine 304; Corelli 445; Cotes 463; Dinah Mulock Craik 472; Crockett 479; Churchill 307; Cross 452; Dickens 529; *Bleak House* 226; *Christmas Carol* 395; *The Cricket* 478; *David Copperfield* 452; *Great Expectations* 799; *Old Curiosity Shop* 1328; *Oliver Twist* 1380; *Our Mutual Friend* 1401; *Pickwick Papers* 1438; Disraeli 534; George Eliot 606; *Romola* 1630; *Silas Marner* 1756; Farjeon 648; C. W. Gordon 782; Haggard 823; Harraden 842; Hardy 837; Hawkins 850; Hewlett 871; Henty 865; Hughes 894; Ingelow 927; Kingsley 1005; Hypatia 996; Kipling 1006; Le Gallienne 1049; Lever 1059; Mitford 1243; Macdonald 1134; Marryat 1176; Meredith 1206; Mille 519; Gilbert Parker 1423; Jane Porter 1531; Reade 1589; Ramée 1584; Quiller-Couch 1574; Clark Russell 1645; Leigh Richmond 1612; Olive Schreiner 1704; Scott 1709; *Bride of Lammermoor* 265; *Ivanhoe* 949; *Kenilworth* 996; *Rob Roy* 1620; *The Talisman* 1867; Stevenson 1825; Thackeray 1897; Mrs. Ward 2041; Warren 2043; John Watson 2055; Weyman 2072; Yonge 2123; Zangwill 2129.
- (2) **History and Biography:** 1091; 876; Allison 50; Arnold (Thos.) 110; Bourinot 253; Bruce 281; Buckle 1091; Carlyle 1130; Collingwood 1091; Cox 471; Creasy 1091; Creighton 1091; Cromer 480; Curzon 489; Forster 1091; Freeman 712; Froude 721; Gardiner 736; Greene 802; Grote 807; Hallam 827; Harrison 844; Lecky 1044; Lyall 1091; Macaulay 1130; Maine 1151; Martineau 1179; May 1091; Merivale 1207; McCarthy 1131; Milman 1228; Napier 1300; Norman 1356; Palgrave 1091; Paul 1091; Petrie 1462; Pollock 1091; Prothero 1553; Rawlinson 1589; Rosebery 1634; Rowton 1091; Sayce 1686; Seeley 1718; Goldwin Smith 1770; Stan-

hope 1810; Dean Stanley 1810; Stubbs 1839; Symonds 1859; Traill 1934; Trevelyan 1091; Sharon Turner 1958.

(3) **Essays and Criticism:** 1090-2; C. G. Allen 51; M. Arnold 110; Birrel 1092; Blouet 230; Brooke 1091; Carlyle 336; Brougham 274; Cobb 416; De Quincey 522; De Vere 1092; Dobson 1092; Dowden 547; Gladstone 771; Hamerton 830; Howitt 893; Hunt 899; Hutton 1091; Lamb 1023; Sidney Lee 1048; Mackintosh 1090; Mallock 1152; Morley 1262; Pater 1092; Pattison 1092; *Punch* 1561; Ruskin 1644; *King of the Golden River* 1003; Saintsbury 1091; Smiles 1769; Sydney Smith 1771; Stead 1815; Leslie Stephen 1091; John Wilson 2092.

(4) **Science (including, also, economics, philology, jurisprudence and medicine):** 1091-2; Bagehot 157; S. W. Baker 158; Ball 161; Brewster 265; Clerk-Maxwell 1192; Buckland 283; Darwin 505; Davy 509; Dawson 509; Drummond 555; Faraday 648; Galton 731; Geikie 742; Kelvin 996; Kidd 1091; Layard 1040; Livingstone 1103; Lodge 1107; Lubbock 1122; Lyell 1126; Malthus 1153; Hugh Miller 1227; Mivart 1243; Murchison 1280; Osler 1397; Playfair 1504; Proctor 1551; Ramsay 1585; Rayleigh 1589; Ricardo 1610; Romanes 1628; Salisbury 1665; Selous 1721; Seton 1727; Somerville 1780; Speke 1795; H. M. Stanley 1811; Stewart 1826; Sterling 1827; Tait 1886; Tylor 1961; Tyndall 1961; Daniel Wilson 2091.

(5) **Philosophy and Theology (including Works on Relations of Religion and Science):** 1091-2; 1471; Balfour 160; Caird 1091; Chalmers 363; Chambers 363; Fairbairn 645; Farrar 649; Flint 1091; Gore 1091; Hall 827; Hamilton 831; Lewes 1060; Liddon 1066; Manning 1161; Mansel 1091; Martineau 1179; Maurice 1091; Mill 1226; Muller (Max) 1276; Newman 1343; Pusey 1564; Robertson 1620; Spurgeon 1806; Trench 1941; Tulloch 1950; John Wesley 2068; Westcott 2069; Whately 2073; Whitefield 2078.

XXIV. CANADIAN.

G. M. Adam 10; W. J. Alexander 45; Grant Allen 51; H. M. Ami 64; Bourinot 253; George Bryce 281; Cotes 463; J. B. Crozier 482; W. H. Drummond 555; W. A. Fraser 710; Fréchette 711; C. W. Gordon 582; G. M. Grant 792; Haliburton 826; Hannay 834; Hughes 894; Maclaren 1139; Marchand 1168; Mille 519; O'Brien 1369; Gilbert Parker 1423; Selwyn 1721; Seton 1727; Shanly 1734; Daniel Wilson 2091; R. R. Wright 2112.

XXV. AMERICAN.

1. THE COLONIAL PERIOD (1607-1783):

a. Poetry: Barlow 1093; Eliot 606; 1092; Hopkinson 1093; *Hail Columbia* 824; Trumbull 1093; *Yankee Doodle* 2120; 1093.

b. Prose:

(1) **History:** Berkeley 1092; Bradford 256; 1092; Byrd 1092; Captain John Smith 1770; 1092; Pocahontas 1509; Stith 1092; Winthrop 2097; 1092.

(2) **Religious Writings:** Cotton 465; Mather 1188; 1092; Woolman 1093; Quakers 1570.

(3) **Philosophy:** Edwards 588; 1092; Franklin 708; 1093.

(4) **Political Writing and Oratory:** 1092-3; Adams (Sam.) 12; 1093; Hastings 1093; Henry 865; 1093; Jefferson 967, 1093; *Declaration of Independence* 513; Lee (R. H.) 1046; 1093; Warren (J.) 2043; 1093.

2. THE NATIONAL PERIOD (1783-):

a. The Rise of National Literature (1783-1860):

(1) **Poetry (in order of time):** Freneau 1093; Key 1000. 1093; *Star Spangled Banner* 1812; Mrs. Sigourney 1756; Bryant 280; 1095; Drake 550; 1093; Woodworth 1094; Wilde 1094; Halleck 1093; Greene 1094; Payne 1432, 1094; *Home, Sweet*

Home 883; Willis 2089; 1095; Smith (S. F.) 1770; *America* 62; Longfellow 1112; 1094; *Evangeline* 625; *Hiawatha* 871; Standish 1809; Whittier 2081; *Snowbound* 1774; 1095; Holmes 880; 1094; Poe 1509; *The Raven* 1588; 1095; Lowell 1121; 1094; *Launfal* 1035; Whitman 2079; 1095; Boker 237; Read 1589; 1095; Foster 702; *My Old Kentucky Home* 1294; Alice and Phœbe Cary 344; Larcom 1031; 1097; R. H. Stoddard 1830.

(2) Prose (writers chronologically arranged):

(a) **Fiction:** Brown (C. B.) 274; Cooper 450; *Last of the Mohicans* 1033; *Leatherstocking Tales* 1043; 1094; Irving 943; *Ichabod Crane* 911; 1093; *Rip Van Winkle* 1617; Miss Sedgwick 1717; Mrs. Child 384; Goodrich 780; Hawthorne 851, 1094; *Grandfather's Chair; Marble Faun* 1168; Simms 1759; Mrs. Stowe 1834; 1095; Susan Warner 2042; 1097; Mrs. Whitney 1097; Trowbridge 1945; 1097; W. T. Adams 12.

(b) **Belles-Lettres (Criticism, Essays, Humor):** 1093-5; Channing 367; 1094; R. H. Dana 500; Ticknor 1910; Bulfinch 288; Emerson 612; 1094; Margaret Fuller 722; Tuckerman 1949; Shillaber 1742; Thoreau 1906; 1094; R. G. White 2078; D. G. Mitchell 1242; G. W. Curtis 489, 1097; Bayard Taylor 1875; Browne *(Artemus Ward)* 276; William Winter 2097.

(c) **History and Biography:** 1093-5; Wirt 2098; Ramsay 1585; Benton 201; Sparks 1791; Prescott 1544; 1094; Wise 2101; Bancroft 165; 1094; Hildreth 873; Thompson 1905; G. T. Curtis 489; S. W. Williams 2089; Henry Wilson 2091; Headley 853; Lossing 1116; 1095; Motley 1271; 1094; Parton 1426; 1098; Parkman 1424; 1095; Lea 1040; Fisher 677; M. C. Tyler 1961; 1098.

(d) **Oratory and Political Writing:** 1093-5; Pelatiah Webster 2064; Washington 2047; Jay 966; 1093; Dane 501; Ordinance of 1787 p. 1391; Alexander Hamilton 830; *The Federalist* 830, 966; 1519; Madison 1142; 1093; Fisher Ames 63; 1093; Monroe 1253; Gallatin 730; Clay 496; 1094; Calhoun 307; 1094; Daniel Webster 2062; 1094; Hayne 852; Everett 636; 1094; Weed 2064; Choate 393; 1094; Garrison 738; 1095; Greeley 801; Phillips 1471; 1095; Sumner 1847; 1095; Douglass 546; C. A. Dana 499; Poore 1527; Nordhoff 1355.

(e) **Philosophy and Religion:** 1093-5; Boudinot 251; Dwight 565; Leonard Bacon 154; Lyman Beecher 193; Alexander Campbell 316; Wayland 2060; Muhlenberg 1275, Bronson Alcott 42; Mark Hopkins 885; Ray Palmer 1413; Freeman Clarke 405; Theodore Parker 1423; Bowen 253; McCosh 1133; Peabody 1432; Noah Porter 1531; Henry Ward Beecher 193; H. R. Smith 1770; Storrs 1834; Collyer 425; Brace 255; Morgan Dix 537; W. T. Harris 843.

(f) **Science (including economics, jurisprudence and philology):** 1093-5; Murray 1281; Rush 1644; Noah Webster 2063; Marshall 1177; Kent 997; Alexander Wilson 2091; Story 1834; Audubon 135; Worcester 2109; Carey 334; Schoolcraft 1690; Walker (A.) 2035; Marsh 1177; Dix 536; Bache 153; Louis Agassiz 25; Guyot 817; Barnard 173; Maury 1191; J. D. Dana 500; R. H Dana, Jr., 500; Kane 988; Squier 1806; Baird 158; Chadbourne 362; Cooley 449; Winchell 2093; W. D. Whitney 2081; Wells 2067; Terhune 1892; I. I Hayes 852.

b. The Maturity of American Literature

- **(1) Poetry:** 1095-8; Leland 1052; Emily Dickinson 530; Stedman 1819; 1097; Aldrich 43; 1097; Butterworth 297; Randall 1586; *Maryland, my Maryland* 1182; Joaquin Miller 1227, Lanier 1028; Gilder 766; 1097; Carleton 334; Fawcett 651; 1097; Bates 181; Field 659; Markham 1173; Riley 1615; Wilcox 2083; Carman 336; Dunbar 561; *The Battle Hymn of the Republic* 183; Mrs. Howe 892.
- **(2) Prose:**
  - **(a) Fiction (authors in order of time):** 1095-8; Holland 879; 1097; Hale 826; 1095; *Man Without a Country* 1165; R. M. Johnston 977; 1096; Lew Wallace 2036; 1098; Weir Mitchell 1243; 1096; Mrs. Barr 174; Mrs. Davis 508; Helen Hunt Jackson 953 and 1097; Stockton 1829 and 1905; Mrs. Spofford 1800; 1097; Howells 892; 1097; Eggleston (E.) 589; 1095; M. M. Dodge 538; Tourgee 1928; G. C. Eggleston 1098; Bret Harte 845; 1095; Habberton 820; Henry James 958; 1097; Mrs. Phelps—Ward 1465; 1097; Maurice Thompson 1096; G. W. Cable 300; 1097; Mrs. Burton Harrison 844; 1097; Julian Hawthorne 851; 1097; Mrs. Catherwood 1096; Mrs. Foote 692; Westcott 1097; Joel Chandler Harris 842; P. H. Hayne 1097; James Lane Allen 52; 1097; Bellamy 198; Miss French 714; 1097; Miss Murfree 1280; 1097; Lathrop 1034; Goss 1097; Hastings 1097; Robert Grant 1098; Thos. Nelson Page 1408; Marion Crawford 474; 1097; Major 1096; Mrs. Atherton 1097; Mrs. Deland 516; Mrs. Riggs 1615; 1097; Bacheller 1097; Wister 2101; Garland 737; 1097; 1098; Mrs. Wilkins-Freeman 712; 1097; Amelie Rives 1617; R. H. Davis 508; Ford 1096 G. B. McCutcheon 1134; Mrs. Craigie 472; Naylor 1097; Tarkington 1871; 1098; Churchill 397; Crane 473; 1097; Jack London 1112.
  - **(b) Belles-Lettres (Criticism, Essays, Humor):** 1095-8; H. W. Shaw 1735; Higginson 873; Norton 1361; Mrs. Croly 480; Mrs. Miller 1227; Clemens 408, 1095; Burroughs 295; Scudder 1711, 1098; C. W. Stoddard 1830; Burdette 290; Mabie 1129; Brander Matthews 1189; Van Dyke 2003; Bangs 163; Ade 13; Dunne 562; Hapgood 836.
  - **(c) History (including Biography and Autobiography):** 1095-8; Jefferson Davis 507; A. W. Stephens 1822; 1095; Sherman 1741; Curry 488; U. S. Grant 793; J. D. Cox 471; O. O. Howard 892; P. H. Sheridan 1739; Winsor 2097; 1098; H. H. Bancroft 166; Nicolay 1095; A. D. White 2077; Hurst 901; C. K. Adams 10; Foster 701; Henry Adams 10; Hay 851; 1095; Schouler 1095; Mahan 1148; 1095; Morse 1098; Holst 881; Fiske 678; 1098; Andrews 71; 1095; Rhodes 1098; H. B. Adams 10; Lodge 1107; 1098; Sloane 1767; 1098; McMaster 1140; 1098; Hart 1095; B. I. Wheeler 2075; Woodrow Wilson 2092; Tarbell 1871; Roosevelt 1631; 1098.

(d) Oratory and Political Writing: 1095-8; Lincoln 1073-5; 1094; Mrs. Livermore 1102; Cox (S. S.) 471; Schurz 1705; 1098; Halsted 829; Blaine 224; Miss Dodge 538; Ingalls 926; Ingersoll 926; Watterson 2057; Reid 1599; Beveridge 208; Bryan 280.

(e) Philosophy and Religion (authors arranged chronologically): Cardinal Gibbons 764; Lyman Abbott 1; Phillips Brooks 273; Gladden 770; Archbishop Ireland 938; Bishop Spalding 1789; Ladd 1019; Parkhurst 1424; Patton 1430; Barrows 175; Adler 14; Schurman 1705; Gunsaulus 816; Hillis 874.

(f) Science (also including economics, jurisprudence, philology and sociology): Bascom 177; Hammond 832; Gildersleeve 766; Gilman 767; Eliot 606; Langley 1026; Powell 1541; Newcomb 1341; Flint 682; Brinton 268; Muir 1275; Henry George 752; Packard 1407; Cope 451; F. A. Walker 2035; Wright 2112; Holmes 881; Shaler 1733; Coues 465; William James 958; Kennan 997; G. S. Hall 827; S. E. Tillman 1913; Riis 1615; Coulter 466; Zahm 2128; Ely 610; E. J. James 956; Hadley 822; W. R. Harper 841; Peary 1436; Peck 1437; Albert Shaw 1735; Baldwin 160; N. M. Butler 295; Muensterberg 1274.

XXVI. AUTHORS OF OTHER LITERATURES.

Carmen Sylva (Queen Elizabeth) of Roumania: 607; *Dora d' Istria* (Princess Koltsof-Masalski) of Roumania 1010; Gorki of Russia 783; Huss of Bohemia 901; Ixtiilxochitl of Mexico 951; Kossuth of Hungary 1012; Maeterlinck of Belgium 1143; Nordau of Hungary 1354; Sienkiewicz of Poland 1753; Tolstoi of Russia 1921; Turgeney of Russia 1954; Vambéry of Hungary 2000; Ulfilas of the Goths 1964; Goths 785.

XXVII. YOUNG FOLK'S LITERATURE.

1. BOOKS FOR EARLY CHILDHOOD: 1098.

(The figures denote the pages where the subjects or authors are discussed.)

Andersen 69: *Fairy Tales.*
Baldwin: *The Story of Roland* 1625; *The Story of Siegfried* 1756; *The Story of Troy* 1945.
Church: *Stories from Herodotus* 868; *Stories from The Iliad* 882; *Stories from The Odyssey* 1965.
Eugene Field 659: *Poems* and *Stories.*
Greene: *King Arthur* 114.
Grimm 806: *Fairy Tales.*
Hawthorne, N. 851: *Tanglewood Tales* and *The Wonder-Book.*
Kingsley 1005: *Greek Heroes.*
Kipling 1006: *Puck of Pook's Hill* and *Wee Willie Winkie.*
Lanier 1028: *The Boys' King Arthur.*
Lowell: *Jason's Quest* 95; 965.
Longfellow 1112: *Hiawatha* 871.
Mabie 1129: *Norse Stories* 1295.
Mother Goose 1270; 1454.
Peabody: *Old Greek Folk-Stories* 1295.
R. L. Stevenson 1825: *Book of Poems.*
The Bible 209; Stories.

2. BOOKS FOR LATER CHILDHOOD: 1099.

a. Fiction and Poetry:

Addison 12: *Sir Roger de Coverley* 469.
Aldrich 43: *The Story of a Bad Boy.*
Arabian Nights' Tales 1084.
Andrews: *Ten Boys.*
Robert Browning 276: *The Pied Piper* and *How They Brought the Good News.*
Bunyan 290: *The Pilgrim's Progress* 1490.

Mrs. Burnett 293: *Little Lord Fauntleroy.*
Cervantes 361: *Don Quixote.*
Clemens 408: *Huckleberry Finn* and *Tom Sawyer.*
Cooper 450: *The Last of the Mohicans* 1033.
Defoe 515: *Robinson Crusoe.*
Dodgson 538: *Alice's Adventures* and *Through the Looking Glass.*
George Eliot 606: *Silas Marner* 1756.
Goldsmith 778: *The Deserted Village* and *The Vicar of Wakefield* 2018.
Hughes 894: *Tom Brown's Schooldays.*
Irving 943: *Sketches* and *Tales of a Traveler.*
Kingsley: *The Water Babies.*
Lamb 1023: *Tales from Shakespeare.*
Macaulay 1130: *Lays of Ancient Rome* 1620.
Masson: *Little Masterpieces. Peasant and Prince.*
Pyle 1565: *Adventures of Robin Hood* 884.
Ramee 1584: *A Dog of Flanders* and *The Nurnberg Stove.*
Ruskin 1644: *The King of the Golden River* 1003.
Scott 1709: *Ivanhoe* 949; *The Lady of the Lake* 1020; *Rob Roy* 1620; *Tales of a Grandfather.*
Anna Sewall: *Black Beauty.*
Shakspere 1733: *The Merchant of Venice* 1206.
Stevenson: *Treasure Island.*
Swift 1856: *Gulliver's Travels* 272; 1071.
Thackeray 1897: *The Rose and the Ring.*
Warner 2042: *Being a Boy.*
J. R. Wyss: *Swiss Family Robinson.*

b. Heroes and Stories of the Nations:

Dickens 629: *A Child's History of England* 615.
Franklin 708: *Autobiography.*
Guerber: *The Story of the English* 618.
Higginson 873: *Young People's History of the United States* 1967; 86.
Lives: Alfred the Great 47.
Alexander the Great 44.
Julius Cæsar 303.
Oliver Cromwell 481.
Daniel Boone 244.
Kit Carson 342.
Robert La Salle 1032.
Abraham Lincoln 1073.
William Penn 1446.
Peter the Great 1459.
Captain John Smith 1770.
Miles Standish 1809 and others of peculiar interest to children.
Plutarch 1506: *Lives of Famous Men.*
Scudder 1711: *Life of Washington* 2047.

c. Travel and Adventure: 1099.

Samuel Champlain 365.
Captain Cook 449.
Christopher Columbus 430.
Fernando de Soto 523.
Francis Drake 549.
John C. Fremont 713.
Vasco da Gama 732.
Sven Hedin 857.
David Livingstone 1103.
Lewis and Clark 1060.
Ferdinand Magellan 1144.
Fridtjof Nansen 1299.
H. M. Stanley 1810.

d. Stories from Nature: 1099; 1307; 1309.

Ball 161: *Starland* 1813.
Burroughs 295: *Birds and Bees* 190; 217; *Squirrels* 1806.
Higginson 873: *Three Outdoor Papers.*
Keyser: *Bird-Land* 217.
Kingsley: *Madam How* and *Lady Why* and *Town-Geology.* 1099.
Lowell 1121: *A Good Word for Winter.*
Mathews: *Familiar Flowers.* 1099.
Olive Thorne Miller 1227: *First Book of Birds* and *Birds Through an Opera-Glass.*
Pearson: *Stories of Bird-Life.* 1099.
Seton 1727: *Krag and Johnny Bear.*
Thoreau 1906: *Walden.*
Torrey: *The Footpath Way.* 1099.
Wheelock: *Nestlings in Forest and Marsh.* 1099.
White (Gilbert): *Natural History of Selborne.* 1099.

3. IMPORTANCE OF LITERATURE FOR THE YOUNG: 1099.

4. METHODS OF TEACHING: 1099; 1100.

5. ENGLISH CLASSICS IN THE SCHOOLS: 1100.

Matthew Arnold 110; *Sohrab and Rustum.*
Hawthorne: *Tales of the White Hills* 2079.
Irving: *Rip Van Winkle* and *Sleepy Hollow* 911.
Longfellow: *Courtship of Miles Standish* 42; 1809.
Lowell: *The Vision of Sir Launfal* 1035.
Motley 1271: *Peter the Great.*
Schurz 1705: *Abraham Lincoln* 1073.
Scott: *Marmion* 1104.
Shakspere: *Julius Cæsar* 303.
Daniel Webster 2062: *Bunker Hill Speech* 289.
Whittier 2081: *Snowbound* 1774.

6. IMPROVED METHOD OF INTERPRETING LITERATURE: 1100.

7. PERIODICAL LITERATURE: 1100.

8. THE OPPORTUNITY OF THE HOME: 1100.

9. BOOKS ABOUT BOOKS FOR CHILDREN: 1100.

Baldwin: *The Book-Lover.*
Chubb: *The Study and Teaching of English.*
Clark: *How to Teach Reading.*
Dye: *The Story-Teller's Art.*
Lowell: *Books and Reading.*
McMurry: *Oral Work with Stories; Special Method in Primary Reading; Special Method in Reading English Classics.*
Thacher: *The Listening Child.*
Van Dyke: *Counsel on Reading.*
Wiltse: *The Place of the Story in Early Education.*

PHYSICS

1. **PROPERTIES OF MATTER:** Physics 1482; science 1706; force 692; conservation 445; perpetual motion 1454.

2. **MECHANICS OF SOLIDS:** 1196; 1814.
   - a. **Fundamental units of measurement standards:** 1195; 1213; 570.
   - b. **Gravitation:** 796; 1184.
   - c. **Acceleration:** dynamics 566; inertia 925.
   - d. **Laws of motion:** dynamics 567; least action 1042; centrifugal force 360; simple harmonic 1759.
   - e. **Machines:** Wheel 2074; windmill 2093; screw propeller 1711; pump 1561; lathe 1034.
     - 1. **Lever:** 1059.
     - 2. **Pulley:** 1560; 228.
     - 3. **Inclined plane:** 917.
     - 4. **The Pendulum:** 1144.
     - 5. **General law of machines:** 567.

3. **MECHANICS OF FLUIDS:** 903; 2025; 1851.
   - a. **Pressure in liquids due to gravity:** pressure 1546; water-wheel 2053; siphon 1761.
   - b. **Pressure due to externally applied force:** manometer 116; hydraulic motor 903; elevator 605.
   - c. **Pascal's experiment:** 174.
   - d. **Specific gravity:** 521.
   - e. **The hydrometer:** 906.

4. **MECHANICS OF GASES:** 1508; 946; 438; 1078.
   - a. **Pressure of atmosphere:** 33; 72.
   - b. **Barometers:** 174.
   - c. **Boyle's law:** 255.
   - d. **Diving bells:** 536.
   - e. **Balloons and airships:** 18.
   - f. **Airpump:** 34; 1997.

5. **MOLECULAR MOTION:**
   - a. **Relative motion of molecules:** Wave motion 2058; simple harmonic motion 1759.
   - b. **Vapor pressure:**
     - 1. **Dew point:** 526.
     - 2. **Humidity:** 2051; 412; 1582.
     - 3. **Evaporation:** 636.
   - c. **Temperature:** 1886; heat 855; thermometer 1900; pyrometer 1567.
   - d. **Elasticity:** 593; testing machines 1894; Hooke's law 884.

6. **STUDY OF LIGHT:**
   - a. **Transmission of light:** light 1067; ether 627; light waves 2059.
   - b. **Reflection:** 1067; dispersion 534; heliograph 859.
   - c. **Refraction:** 1067; diffraction 531; diffraction grating 531; spectroscope 1793; plucker tube 1506; interference 932; polarization 1515.
   - d. **Prisms:** 1550; 1125.
   - e. **Optical instruments:**
     - 1. **Lenses:** 1053; eye 643; spectacles 1793; focus 688.
     - 2. **Photography:** 1476; camera 315.
     - 3. **Microscope:** 1220.
     - 4. **Telescope:** 1885; opera-glass 1386; micrometer 1220; telemeter 1883; magic lantern 1144.
   - f. **Color:** 427; color photography 1477; actinism 9.

7. STUDY OF HEAT:

- a. **Charles' law:** 370.
- b. **Work:** Erg 623; caloric 311; heat 856.
- c. **Power:** 1541; dynamometer 569; radiometer 1579.
- d. **Energy:** force 692; geyser 762.
- e. **Specific heat:** 1793; 856.
- f. **Heat engines:** Gas engine 740; automobile 147; steam engine 1815; governor 788; indicator 922; turbine 1153; boiler 236; stoker 1830; injector 926; safety valve 1652.
- g. **Artificial refrigeration:** 1598; ice machines 911.
- h. **Conduction, convection and radiation of heat:** heat 855; radiation 1579.
- i. **House heating:** 856.

8. STUDY OF SOUND:

- a. **Sound and its transmission:** 8.
- b. **Wave motion:** 2058.
- c. **Velocity of sound:** 8.
- d. **Reflection of sound:** 579.
- e. **Loudness of sound:** 8.
- f. **Pitch:** 1495.
- g. **Vibration:** Acoustics 8; resonance 1602; phonograph 1474; voice 2026.
- h. **Musical instruments:** Violin 2022; organ 1393; pianoforte 1487; harp 841; flute 687; lute 1124; reed 1597; bagpipe 157; saxhorn 1685; saxophone 1686; trombone 1944; cymbals 492; drum 554; tambourine 1868; guitar 813.
- i. **Harmony:** 838; music 1286.

9. MAGNETISM:

- a. **Magnets:** 1145; 907.
- b. **Magnetic field:** 1145.
- c. **The earth as a magnet:** 1145.
- d. **The compass:** 435.

10. STATIC ELECTRICITY: Roentgen rays 1624; cathode rays 351; Becquerel rays. 190.

11. CURRENT ELECTRICITY:

- a. **Current:** 597; dynamo-electric machines 568; voltmeter 2029; galvanometer 731; transformers 1934; armature 104.
- b. **Potential:** 1537.
- c. **Resistance:** Ohm's law 598; Wheatstone's bridge 2074.
- d. **Units of electrical measurement:** 599; power 1542; ampére 65.
- e. **Cells:** Voltaic cell 597; battery 182; storage battery 1833.
- f. **Chemical, magnetic and heating effect of the current:** 5[illegible]; induction coil 923; lines of force 1077; lightning arrester 1069; magnetic induction 11[illegible]5; thermostat 1901.
- g. **Electroplating:** plating 1502; electrolysis 603.
- h. **Dynamo:** 568.
- i. **Motor:** electric motor 600; motor 1271; Niagara power 1346; trolley-cars 1943.
- j. **The telegraph:** 1881; wireless 1883; cable 301; telephone 1884; electric lamps 599; microphone 1220; photophone 1478; telephotography 1885; phonophone 1475; telautograph 1881.

DISTINGUISHED PHYSICISTS: Archimedes 92; Galileo 730; Newton 1344; Torricelli 1925; Huygens 902; Regnault 1598; Fahrenheit 645; Celsius 357; Kepler 1000; Watt 2056; Davy 509; Faraday 648; Maxwell 1192; Hertz 870; Bunsen 289; Herschel 869; Kelvin 996; Helmholtz 860; Thomson 1906; Rowland 1639; Tesla 1894; Michelson 1218; Boyle 255; Gilbert 766; Bacon 154; Franklin 708; Cavendish 353; Galvani 731; Volta 2028; Rumford 1643; Carnot 338; Clausius 406; Joule 930; Young 2125; Fresnel 718; Draper 551; Fraunhofer 710; Kirchhoff 1006; Langley 1026; Newcomb 1341; Oersted 1372; Ohm 1375; Henry 864; Weber 2062.

BOTANY

THE SCOPE OF THE SUBJECT: Botany 249.

DIVISIONS OF THE STUDY:

Taxonomy — the classification of plants 1875.
Morphology—the forms of plants 1264.
Physiology — the activities of plants 1487.
Ecology — the environment of plants 580.

I. TAXONOMY:

THE FOUR DIVISIONS OF THE PLANT KINGDOM:

1. **Thallophytes:** meaning thallus-plant; having a characteristic plant-body 1897.
2. **Bryophytes:** having distinct alteration of generations and more complex body 281.
3. **Pteridophytes:** having a leafy and vascular sporophyte; and producing no seeds 1558.
4. **Spermatophytes:** meaning seed-plants, called flowering plants 1797.

(Note: The first three of the above divisions are called Cryptogams — plants that do not produce seeds — 484. There is also a group between plants and animals called Myxomycetes: 1297.)

1. THE THALLOPHYTES: the lowest group of plants 1897.

- a. **The Algæ:** most primitive forms of the plant kingdom 48; and making their own food with chlorophyll 393.
  - (1) **The Cyanophyceæ:** the blue-green algæ, or green slimes 491; coenocyte 419; Heterocyst 871.
  - (2) **The Chlorophyceæ:** the green algæ 392.
    - (a) **Protococcus forms:** 1554.
    - (b) **Conferva forms:** 392.
    - (c) **Siphon forms:** as spirogyra 1800.
    - (d) **Conjugate forms:** or brown algæ 1463.
  - (3) **The Phæophyceæ or brown algæ:** 1463; the Sargassum, making the Sargasso seas 1681.
  - (4) **The Rhcdophyceæ or red algæ;** prized souvenirs of the seashore 1609; Lichens — intermediate forms 1065; symbiosis 1859.
- b. **The Fungi:** taking their food from other plants 724; parasites 1420; saprophytes 1678; mycelium 1293; mycorrhiza 1294.
  - (1) Four groups of fungi:
    - (a) **Phycomycetes:** 1479; as black-moulds, downy mildews 1224; cœnocyte 419.
    - (b) **Ascomycetes:** 17; blue-moulds, truffles, 1946; and perhaps yeasts 2121; mildews 1224.
    - (c) **Æcidiomycetes:** 17; as rusts 1649; and smuts 1772.
    - (d) **Basidiomycetes:** as mushrooms 1284; toadstools 178.

2. THE BRYOPHYTES: the second group of plants 281.

- a. **The Hepaticæ:** the liverworts 865; rhizoids 1606.
  - (1) **Marchantiales:** 1168; green above and with rhizoids on under surface 1606.
  - (2) **Jungermanniales:** like delicate moss 865.

- (3) **Anthrocerotales:** from which the mosses came 1270; and perhaps ferns and seed-plants 78.
- b. **The Musci:** 1282; known as mosses, about 3000 species 1270.
  - (1) the sphagnum mosses: bog-mosses which form peat 1797; 1436.
  - (2) True mosses: 1270.

3. THE PTERIDOPHYTES: 1558.

- a. **The Lycopodiales:** called club-moses or ground-pines 1125.
  - (1) **Lycopodium:** coarse forms 1125.
  - (2) **Selaginella:** the "little club-mosses" 1125.
- b. **The Equisetales:** known as horse-tails or scouring rushes 622.
- c. **The Filicales:** known as the ferns, with about 4000 species 661.
  - (1) **The groups of ferns:** 656:
    - (a) **Tall swamp-ferns.**
    - (b) **Coarse ferns of swamps and woods.**
    - (c) **Small and medium sized ferns.**
    - (d) **Delicate rock and wood ferns.**
    - (e) **The brake fern — growing to seven feet.**
    - (f) **Maiden-hair fern—most highly regarded fern.**
    - (g) **The evergreen wood-fern.**

4. THE SPERMATOPHYTES: reproducing themselves by means of seeds 1797.

- a. **The Gymnosperms:** naked seed-plants 818.
  - (1) **The Gnetums:** growing in deserts and the tropics.
  - (2) **The Ginkgo** or maiden-hair tree 767.
  - (2) **The Cycads:** probably came from the ferns 492.
  - (4) **The Conifers:** the greatest group of living gymnosperms 443; containing pines 1491; spruces (fir) 675; hemlocks 860; redwoods (sequoia) 1724; cedars 354; cypresses 492; junipers 982; yews 2126.
- b. **Angiosperms:** seeds exposed — the most recent group of plants 73.
  - (1) **The Monocotyledons:** 1292.
    - (a) **Grasses:** 795.
    - (b) **Lilies:** 1070.
    - (c) **Orchids:** 1390.
    - (d) **Palms:** 1412.
    - (e) **Epiphytes:** air-plants 622; like Spanish moss, orchids 1390.
  - (2) **The Dicotyledons:** 100,000 species 530.
    - (a) **First series:** morning glories 1263; phloxes 1472; gentians 744; mints 1237; verbenas 2010; composites 435; which include asters 126; thistle 1904; goldenrod 778; sunflowers 1849; chrysanthemum 396; daisy 496; sage 1653; dandelion 500.
    - (b) **Second series:** buttercups 296; mustards 1292; cabbage, cauliflower, rutabaga and turnip 1292; roses 1633; common forest trees — as oak 1367; hickory 872; walnut 2038; birch 192; elm 609; poplar 1528.

II. MORPHOLOGY.

- 1. **THE CELL:** the unit of structure 355.
  - a **Cellulose:** cell-wall 357.
  - b **Protoplasm:** the living substance of the cell 1554.
    - (1) The nucleus 1365.
    - (2) The cytoplasm 493.
  - c **Karyokinesis:** cell division 993; as in diatoms 527; and nostoe 492.
    - (1) **Meristem** or formative tissue 1207.
- 2. **THE SPORES:** special cells for reproduction 1803.
  - a **The Archesporium:** which sets apart certain cells for reproduction 91.
  - b **Asexual spore:** —formed by cell division 117.
    - (1) **The sporangium:** in which the spores are formed 1803.
    - (2) **The tetrad formation:** four sister spores 1894.
  - c **Sexual spore:** formed by union of cells 1730.
    - (1) **The gametes:** or sexual cells 735.
    - (2) **The antheridium:** or male organ 78.
    - (3) **The archegonium:** or female organ 91.
    - (4) **The sperm:** the male cell 1796.
    - (5) **The oösphere:** the female cell 1385.
    - (6) **The oöspore:** or fertilized egg 1385.
- 3. **ALTERNATION OF GENERATION:** 55.
  - a. **Gametophytes:** the generation producing sex-organs 55; apogamy 83.
  - b. **Sporophytes:** the generation producing asexual spores 1804; apospory 83.
  - c. **Homospory:** in which the gametes are alike 883.
  - d. **Heterospory:** in which the gametes are unlike 871.
    - (1) **Microspores:** producing male gametophyte 1221; microsporangium 1221.
    - (2) **Megaspores:** producing a female gametophyte 1199; megasporangium 1199.
- 4. **THE SEEDS:** which produce the flowering plants 1718.
  - a. **Parts of the seed:**
    - (1) **The testa:** or hard coat upon which hairs and wings grow 1894.
    - (2) **The embryo:** the essential part of the seed 611;
      - (a) **Cotyledons:** the first leaves developed 465.
      - (b) **Hypocotyl:** the stem-like portion beneath 907.
    - (3) **The endosperm:** food tissue within embryosac 614.
    - (4) **The perisperm:** food tissue outside embryosac 1452.

- **b. The dispersal of seeds** 1717.
  - (1) **By currents of air:** as the thistle 1904; milkweed 1226; dandelion 500;
  - (2) **By currents of water:** from headwaters to floodplains and banks.
  - (3) **By animals:** indigestible seeds; and grappling appendages.
  - (4) **By explosive fruits:** forcibly discharging seeds.

5. **THE SHOOT:** part of the plant growing upward 1747.
   - a. **The Stem:** axis of the plant 1821.
     - (1) **The meristem:** formative tissue in all growing organs 1207.
     - (2) **The dermatogen:** the embryonic region producing epidermis 522;
       - (a) **The epidermis:** protective covering of all higher plants 621;
       - (b) **The hypodermis:** cells just beneath epidermis 907;
       - (c) **The collenchyma:** having a pearly-white luster 425.
       - (d) **The hair:** cells formed outside the epidermis 825.
     - (3) **The periblem:** the embryonic region producing cortex 1452.
       - (a) The cortex: tissue containing the active cells 462; the bark 172; the bast 179; the cork 456.
     - (4) **The plerome:** the embryonic region producing the stele 1504.
       - (a) **The stele:** the central region of mature stems 1821.
         - 1. **The vascular bundles:** the conducting system 2004; sclerenchyma 1707; the xylem or wood 2118, containing the trachea 1930; the phloem or bast—for the transfer of food 1472.
         - 2. **The heartwood:** the colored wood 854.
         - 3. **The sapwood:** new wood through which sap flows 1678.
     - (5) **The bud:** an undeveloped shoot 283;
       - a. **Leaf-buds:** from which the axis grows.
       - b. **Flower-buds:** from which the flower comes.
     - (6) **Rootstock or rhizom:** an underground stem 1633.
       - a. **The Tuber:** one form of underground stem 1948; as potato 1537.
     - (7) **The node:** joints in the stem 1354.
     - (8) **The internodes:** portions of stem between the nodes 933.
   - b. **The Branch:** a repetition of the axis of stem 259.
     - (1) **Dichotomous branching:** axis dividing into two branches 529.
     - (2) **Monopodial branching:** giving of branches from side of stem 259.
     - (3) **Chladophyll:** branches which replace leaves 403.
     - (4) **The axil:** where branches normally arise 149.
   - c **The Leaf:** expanded organ of higher plants, for displaying green tissue to air and sunlight 1041.
     - (1) **Deciduous leaves:** growing off every year 512.

- **(2) Phyllotaxy or the arrangement of leaves.**
  - **(a) The verticillate or cyclic arrangement:** two or more leaves at one node 1480.
  - **(b) The alternate or spiral arrangement:** single leaf at each node 1480.
    - 1. **Angular divergence:** how obtained.
- **(3) Structure of the leaf.**
  - **(a) External:** blade — expanded part of the leaf 1041; petiole — stalk upon which the leaf grows 1461; stipules — appendages at the axil 1827.
  - **(b) Internal:** epidermis — upper and lower surfaces of leaf 622; stomata 1831; cuticle 490; mesophyll — giving the leaf its color 1209; chloroplast 393; vein ends — penetrating among mesophyll cells 1041.
  - **(c) Closed venation:** parallel veined leaves, as in grass and the lily 1041.
  - **(d) Open venation:** net-veined or reticulate 1041.
    - 1. **Pinnate leaves.**
    - 2. **Palmate leaves.**
- **(4) Special forms in leaf structure:** 1042; bracts 255; cupule 487; palet 1411; glumes 775; scales 1686; bulb 286; spines 1799; tendril 1888; pitcher plants 1495; carnivorous plants 338.
- **(5) Position of leaf:**
  - **(a) Dorsiventral:** exposing two surfaces to different conditions 545.
  - **(b) Radial:** all sides exposed alike 545.
  - **(c) Profile:** one edge turned toward intense sunlight, as compass-plants 435.

6 THE ROOT: that part of the plant growing downward 1632.

- a. **Epidermis:** the outside covering.
- b. **Cortex:** more or less thickened.
- c. **Axis:** the woody central part.
- d. **Root-cap:** that protects the tip cells in burrowing.
- e. **Root-hairs:** to help the root in absorbing.
- f. **Root tubercles:** which supply the plant with nitrogen 1633.
- g. **Rhizoids:** holdfasts and absorbing organs 1606.
- h. **Mycorrhiza:** aiding roots in absorbing 1294.

7. THE FLOWER: a modified shoot of seed-plants 685.

- a. **Where and how the flowers grow:** 925.
  - (1) **Solitary:** occurring solitary upon plants.
  - (2) **Inflorescence:** clusters of flowers.

- **(a) The botryose type:** lowest flowers the oldest—prominent botryose types of inflorescence: raceme; panicle; thyrsus; corymb; umbel; spike; spikelet; head; ament or catkin; spadix.
- **(b) The cymose type:** topmost flowers the oldest—cyme cluster, resembling the corymb.

b. Structure of the flowers:

- **(1) The receptacle or torus:** in which the floral organs are inserted 1592.
- **(2) The floral organs:**
  - **(a) Floral leaves:** the two outer sets of organs:
    - 1. **The calyx:** 312; composed of sepals 1724.
    - 2. **The corolla:** 459; composed of petals 1459.
  - **(b) Sporangial leaves:** the two inner sets of organs:
    - 1. **The stamens:** outermost set of sporangial leaves 1808.
      - a. **The filament:** a stalk-like portion 661.
      - b. **The anther:** which bears pollen 78; pollen 1518; connective 445.
    - 2. **The carpels:** inner set of sporangial leaves 340.
      - a. **The pistil:** an individual carpel 1494.
      - 1. **The ovulary:** 1402.
      - 2. **The style:** 1842.
      - 3. **The stigma:** 1827.
  - **(c) Modification in the forms of flowers:**
    - (1) **Apetalous:** one set of floral leaves lacking 82.
    - (2) **Naked:** both sets of floral leaves lacking 686.
    - (3) **Pistillate:** stamen set lacking 686.
    - (4) **Staminate:** carpels lacking 686.
    - (5) **Syncarpous:** carpels united 1860.
    - (6) **Apocarpous:** carpels separated 83.
    - (7) **Sympetalous:** petals united 1860.
    - (8) **Polypetalous:** many petals 1522.
    - (9) **Actinomorphic:** regular petals 9.
    - (10) **Zygomorphic:** unlike petals 2138.
    - (11) **Gamosepalous:** sepals united 686.
    - (12) **Monodelphous:** all filaments united 686.
    - (13) **Perianth:** calyx and corolla united 1452.
    - (14) **Epigynous:** sepals, petals and stamens above ovulary 622.
    - (15) **Hypogamous:** sepals, petals and stamens beneath ovulary 907.

III. PHYSIOLOGY.

General Reference: The activities of plants 1487.

1. **NUTRITION:** processes by which food is obtained and utilized 1366.

- **a. How plants obtain food:**
  - (1) **Absorption:** by which materials are taken into the plant body 5.
  - (2) **Aeration:** means for taking in and expelling air and dioxid 18.
  - (3) **Respiration:** by which energy is set free in the plant 1602.
  - (4) **Water transfer:**
    - (a) Ascent of water through vascular system 2051.
    - (b) Transpiration or of water by evaporation 1936.
    - (c) Turgor or pressure of water within the cells 1954.
- **b. How plants utilize their food:**
  - (1) **Metabolism:** all the chemical processes of the living organism 1210.
  - (2) **Digestion:** changing insoluble foods to soluble or soluble to simpler forms 532.
    - (a) Enzymes: or soluble ferments 620.
    - (b) Fermentation: decomposition of substances by living plants 656.
  - (3) **Secretion:** substances separated from the protoplasm 123.
  - (4) **Assimilation:** changing foods into protoplasm 123.
  - (5) **Foods:** materials used in formation and repair of plant-body 690; carbohydrates 332; proteids 1553.
  - (6) **Photosynthesis:** the process of making sugar and starch food 1479; chloroplast 393; chlorophyll 393.
- **c. How plants grow:**
  - (1) **Growth:** alteration of form, increase in size 808.

2. REPRODUCTION: making new plants 1601.

- **a. Vegetative propagation:** 1552.
  - (1) **Gemmæ:** mass of cells producing a new body 742.
  - (2) **Runner:** a branch which takes root at the tip 1643.
  - (3) **Rootstock:** underground stem sending up shoots 1633; tuber 1943.
  - (4) **Grafting:** propagation by a budbearing portion of plant 789.
- **b. Reproduction by means of spores:** 1803.
  - (1) **Pollination:** transfer of pollen from stamen to stigma 1518.
  - (2) **Conjugation:** union of sexual cells which are alike in appearance 443.
  - (3) **Fertilization:** union of unlike cells, sperms and eggs 657.
  - (4) **Germination:** 760.
    - 1. Formation of new plants by spores.
    - 2. Formation of plant from seed.

IV. ECOLOGY.

General Reference: the relation of plants to their environment 580.

1. MOVEMENTS IN PLANTS: 1273.

- **a. Motor organ:** portion of leaf stalk sensitive to a stimulus 1271.
- **b. Irritability:** a condition of protoplasm in which it undergoes a change 943; sensitive plants 1734.
  - (1) **The stimulus:** a change in the surroundings.
  - (2) **The reaction:** the consequent change in the protoplasm.
  - (3) **The death of plants:** a loss of irritibility.

- c. **Chemotaxis:** sensitiveness to a onesided chemical stimulus 376.
- d. **Chemotropism:** sensitiveness to a onesided chemical stimulus 376.
- e. **Geotropism:** sensitiveness to the earth's gravitation 755.
- f. **Heliotropism:** sensitiveness to a change in direction of light 859.
- g. **Hydrotropism:** sensitiveness to presence of moisture 904.
- h. **Phototaxis:** sensitiveness to unequal illumination 1479.
- i. **Rheotropism:** sensitiveness to a direction of current of water 1606.
- j. **Thermotropism:** sensitiveness to heat coming from one side 1901.
- k. **Twining:** caused by sensitiveness to contact 1960.

2. MEANS USED FOR POLLINATION:

- a. **Amenophilious plants:** using the wind for pollination; gymnosperms 818.
- b. **Entomophilious plants:** using insects for pollination; insects and flowers 930.
    - (1) **Self-pollination:** pollen transferred to its own stigma 1519.
    - (2) **Cross-pollination:** pollen transferred to stigma of another flower 1519.

3. RELATION TO FOOD SUPPLY:

- a. **Symbiosis:** living together of plants 1859.
    - (1) **Parasitism:** in which the host is injured 1420.
    - (2) **Mutualism:** in which the host is benefited 1293.
    - (3) **Helotism:** in which the host is neither benefited nor injured 860.
- b. **Saprophytes:** which obtain food from decaying bodies and organic products 1678.
- c. **Carnivorous plants:** which capture insects for food 338.
- d. **Epiphytes:** getting all food from the air 622.
- e. **Hydrophytes:** plants living in water 904.
    - (1) **Free floating societies:** entirely sustained by water.
    - (2) **Pondweed societies:** anchored but submerged.
    - (2) **Swamp societies:** rooted in water but rising above surface.
- f. **Xerophytes:** adapted to dry soil and air 2117.
- g. **Halophytes:** growing in saline or alkaline soil 828.
- h. **Sensitive plants:** folding leaves to avoid drought and too intense light 1724.
- i. **Geophilous plants:** with special structures for preservation 563.

4. DURATION IN PLANTS: 562.

- a. **Annual plant:** lasting a single season 75.
- b. **Biennial plant:** foliage one year, stalk the next 210.
- c. **Perennial plant:** living from year to year 1451.

STUDY OF THE HUMAN BODY

HISTORY OF THE SUBJECT: 212.

Divisions:

- a. **Anatomy, which explains the structure of the body 67.**
- b. **Physiology, which explains the vital activities 1486.**
- c. **Hygiene, which treats of the preservation of health 905.**

I. ANATOMY:

1. THE SKELETON: 1763.

- a. **Bone:** the hard material of the skeleton 242.
- b. **Cartilage:** the gristle or soft bone: 806.
- c. **Skull:** the hard framework of the cranium 1764.
- d. **Hand:** 833.
  - (1) The carpus or wrist, with 8 bones.
  - (2) The metacarpus or palm, with 5 bones.
  - (3) The digits or fingers, with 14 phalanges.
- e. **Foot:** 690.
  - (1) The tarsus or ankle.
  - (2) The metatarsus or instep.
  - (3) The phalanges or toes.

2. THE MUSCLES: 1283.

- a. **Voluntary or striated:** which are controlled by the will.
- b. **Involuntary or smooth:** not controlled by the will.
- c. **Heart muscle:** striated and branched.
- d. **Belly:** the middle part of the muscle.
- e. **Tendon:** the ends of the muscle.
- f. **Origin:** the end attached to a fixed bone.
- g. **Insertion:** the end attached to the moving bone.

3. THE SKIN:

- a. **Epidermis:** or outer skin composed of cells 1764.
- b. **Dermis:** the inner and true skin 1764.
- c. **Sweat glands:** which open through the skin 1764.
- d. **Hair:** which grows from the epidermis 824.

4. THE NERVES: 1320.

- a. **White tissue:** which is composed of fibers.
- b. **Gray tissue:** which is composed of nerve cells.
- c. **Sensory nerves:** made up of sensitive fibers.
- d. **Motor nerves:** made up of motor fibers.
- e. **Tropic nerves:** which regulate nutrition.
- f. **Secretory nerves:** which stimulate secretion.
- g. **Cranial nerves:** connected with head, heart, stomach and intestines.

5. THE BLOOD:

- a. **Plasma:** the fluid part of the blood 1725.
- b. **Fibrin:** fine threads contained in the plasma 1725.
- c. **Serum:** the liquid part of the plasma 1725.
- d. **Red corpuscles:** containing hæmoglobin which holds oxygen 228.
- e. **White corpuscles:** which can creep and change form 228.
- f. **Lymph:** which arises from the plasma in the capillaries 1126.
- g. **Systemic circulation:** blood going through the system 228.
- h. **Pulmonary circulation:** blood going through the lungs 228.
- i. **Portal circulation:** blood going through the liver 1102.

- **6. THE HEART:**
  - a. **Auricles:** chambers of the heart that receive blood 853.
  - b. **Ventricles:** chambers of the heart that expel blood 853.
  - c. **Partition:** separating the right and left cavities 853.
  - d. **Valves:** which regulate the flow of the blood in the heart 853.
  - e. **Arteries:** tubes which carry blood away from the heart 113.
  - f. **Veins:** tubes which carry blood toward the heart 853.
  - g. **Capillaries:** which carry blood from veins to arteries 853.
  - h. **Pulse:** distension of arteries by blood pressure 1560.
  - i. **Valves in veins:** to prevent back flow of blood 853.
- **7. THE LUNGS:**
  - a. **Trachea or windpipe:** the air passage through the throat 1603.
  - b. **Bronchi:** the two branches of the windpipe 1603.
  - c. **Bronchial tubes:** small tubes branching through the lungs 1603.
  - d. **Air sacs:** ends of tubes in lungs 1603.
- **8. THE BRAIN:**
  - a. **Cerebrum:** the fore part of the brain 257.
  - b. **Cerebellum:** the hind part of the brain 257.
  - c. **Medulla Oblongata:** between brain and spinal cord 257.
- **9. THE EYE:** 643.
  - a. **Scleratic coat:** the tough outer coat which forms the cornea.
  - b. **Choroid coat:** the dark middle coat which forms the iris.
  - c. **Retina:** the delicate inner coat, made up of cells, rods and cones.
  - d. **Vitreous humor:** transparent fluid in the main cavity of the eyeball.
  - e. **Aqueous humor:** transparent fluid filling the front cavity of the eyeball.
  - f. **Crystalline lens:** which focuses the light upon the retina.
  - g. **Optic nerve:** which carries sensations to the brain.
- **10. THE EAR:** 572.
  - a. **Outer ear:** the part outside the head and the tube leading inward.
  - b. **Middle ear:** containing the hammer, the anvil and the stirrup.
  - c. **Inner ear:** containing the cochlea and the semicircular canals.
  - d. **Tympanic membrane:** between the outer and middle ear.
  - e. **Eustachian tube:** the air passage from throat to middle ear.
- **11. THE TONGUE:** a muscular organ within the mouth 1922.
- **12. THE NOSE:** the external organ of the sense of smell 1362.
- **13. THE SALIVARY GLANDS:**
  - a. **Parotid;** in front of each ear 1665.
  - b. **Submaxillary:** under the lower jaw 1665.
  - c. **Sublingual:** under the tongue 1665.
- **14. THE TEETH:**
  - a. **Enamel:** the outside of teeth, hardest substance in the human body 1880.
  - b. **Dentine:** a bony substance produced from the dermis 1880.
  - c. **Pulp:** the living substance inside of teeth 1880.

15. **THE STOMACH:** 1831.
    - a. **Outer coat:** a firm serus membrane.
    - b. **Muscular coat:** with muscular fibers running through it.
    - c. **Third coat:** loosely woven fibrous tissue.
    - d. **Mucous coat:** which contains the mucous glands.
    - e. **Cardiac glands:** those glands near the heart.
    - f. **Pyloric glands:** those glands at the intestines.

16. **THE VOCAL CORDS:** by which the voice is produced 2026.

17. **THE LIVER:**
    - a. **Lobules:** with blood and lymph vessels, nerves and bile duct branches running through them. Five sided and composed of cells 1102.
    - b. **Portal veins:** which carry blood through the liver 1102

II. PHYSIOLOGY: 1486.

1. **DIGESTION:**
    - a. **Gastric juice:** which acts on proteids 1831.
    - b. **Pancreatic juice:** a universal digester 1831.
    - c. **Pepsin:** a ferment contained in the gastric juice 1451.
    - d. **Enzymes:** which digest insoluble foods 620.
    - e. **Hydrochloric acid:** which sets the gastric juice working 1831.
    - f. **Saliva:** a digestive fluid made by the mouth 1665.
    - g. **Bile:** a digestive fluid made by the liver 1102.
    - h. **Chyme:** liquid condition of food when it passes from stomach 1831.
    - i. **Lymph:** a fluid which carries food through walls of capillaries 1126.
    - j. **Proteids:** which are mostly tissue-forming foods 1553.
    - k. **Carbohydrates:** the sugars, starch and cellulose foods 775; 1844; 1811.
    - l. **Blood:** which carries food and water to the tissues of the body 229.
    - m. **Liver:** which performs many offices of digestion 1102.

2. **RESPIRATION:**
    - a. **External:** which takes place in the lungs 1603.
    - b. **Internal:** which takes place in the tissues of the body 1603.
    - c. **Air:** which supplies oxygen used in respiration 33.
    - d. **Carbonic acid:** the carbon dioxide formed by respiration 332.
    - e. **Blood:** which carries oxygen to the lungs and tissues and carries dioxide away 228.

3. **THE SENSES:**
    - a. **Smell:** the sense that perceives odors 1768.
    - b. **Taste:** the sense that distinguishes the qualities of foods 1873.
    - c. **Touch:** the sense that distinguishes contact and pressure 1927.
    - d. **Hearing:** the sense by which sounds are distinguished 573.
    - e. **Sight:** the sense that distinguishes the sensations of light 572.

III. HYGIENE:

1. PERSONAL HYGIENE: 905.

- a. Importance of good habits: 821.
- b. How to overcome injurious habits: 822.
- c. The transmission of likenesses from parent to child: 867.
- d. Importance of cleaning and filling cavities of teeth: 1880.
- e. The advantages of play: 734.
- f. The benefits of physical education: 1480.
- g. The value of gymnastics: 818.
- h. The evil results of alcohol: 42.
- i. Defects of the eye: 644.
- j. Care in the selection of spectacles: 1793.
- k. The necessity of breathing pure air: 2042.
- l. How the air is made impure: 2042.
- m. Why the air is purer in the country than in the city: 34.
- n. Foods and foodstuffs: 689.
- o. Adulteration of foods: 16.

2. PUBLIC HYGIENE: 905.

- a. Heating and ventilation of public buildings: 856.
- b. Warming and ventilation of rooms: 2042.
- c. Vaccination, how and why it is used: 1997.
- d. The discovery of vaccination: 969.
- e. Work done by Louis Pasteur: 1428.
- f. Why milk should be sterilized: 1824.
- g. Captain Cook's cure for scurvy: 905.
- h. The use of antitoxin in disease: 1726.
- i. The work of white corpuscles in fighting disease: 229.
- j. The causes of contagious diseases: 155.
- k. The germ theory of disease: 761.
- l. The work done by bacteria: 1219.
- m. The success of hygiene in preventing disease: 905.

CHEMISTRY

- **1. THE DEVELOPMENT OF CHEMISTRY AS A SCIENCE:** 376.
  - a. **The alchemists:** 41.
  - b. **Contributions to the science:** Boyle 225; Priestley 1405; Cavendish 353; Lavoisier 1037; Dalton 498; Davy 509; Thomson 1906; Volta 2029; Faraday 648; Liebig 1066.
- **2. PHYSICAL AND CHEMICAL CHANGES:** 375; 1231.
  - a. **Elements:** 375.
  - b. **Compounds:** 375.
  - c. **Mixtures:** 375.
  - d. **Chemical action:** 375.
- **3. FUNDAMENTAL LAWS AND THEORIES:**
  - a. **Indestructibility of matter:** 375.
  - b. **Definite proportion:** 376.
  - c. **Atomic theory:** 376.
    - (1) **Atoms:** 133.
    - (2) **Molecules:** 1247.
- **4. OXYGEN:**
  - a. **Chemical and physical properties:** 1405; 53.
  - b. **Spontaneous combustion:** 1802.
  - c. **Ozone:** 1406; 53.
- **5. HYDROGEN:** Chemical and physical properties 903.
- **6. WATER:**
  - a. **Composition:** 2051.
  - b. **Mineral waters:** 1232.
  - c. **Hard waters:** 1072.
  - d. **As a solvent:** 2051.
- **7. THE ATMOSPHERE:** 34.
  - a. **Important Constituents:** Oxygen 1405; nitrogen 1353; carbon dioxide 333; moisture as dew 526; rain 1582; clouds 412; frost 720; snow 1773.
- **8. GAS-VOLUME LAWS:**
  - a. **Change in volume of gas for change in pressure:** Boyle's law 255; isothermal 946.
  - b. **Change in volume of gas for change in temperature:** Charles' law 371; Gay-Lussac 741.
- **9. ACIDS, BASES AND SALTS:**
  - a. **Acids** 7; **alkali** 50; **salts:** 1668.
  - b. **Acid, basic, normal and neutral salts:** 1668.
  - c. **Commercial production of acids, bases and salts:** sulphur 1846; acetylene 6; soda 1777; baking powder 159; tartaric acid 1872.
- **10. COMPOUNDS OF NITROGEN:**
  - a. **Ammonia:** 64.
  - b. **Nitric acid:** 1352.
  - c. **Nitrates:** 1353.
- **11. SULPHUR AND ITS COMPOUNDS:** 1846.
- **12. ELECTROLYTIC DISSOCIATION:**
  - a. **Electrolytes and ions:** 603.
  - b. **Laws of chemical equilibrium and mass action:** 603.
  - c. **Applications of electrolysis:** 603.
- **13. CHLORINE AND ITS COMPOUNDS:** 1667.
  - a. **Hydrochloric acid:** 392.
  - b. **Aqua regia:** 353.
  - c. **Bleaching:** 226.
- **14. CARBON:** 332; 599.
  - a. **The allotropic forms of carbon:** allotropy 53; graphite 795; coal 414; lampblack 1024; peat 1436.
  - b. **Properties of charcoal:** 367.
  - c. **The oxides of carbon:** 333; lime 1071.
  - d. **Hydrocarbons:** carbon 332; acetylene 6.
  - e. **Illuminating gas:** 739; natural gas 1306; coke 420; bitumen 221; asphalt 121.
- **15. THE CHEMISTRY OF FOODS:** 689.
  - a. **Proteids:** 1553; nitrogen compounds 1353; 41.
  - b. **Carbohydrates:** 332; starch 1811; sugars 1844; cellulose 357; photosynthesis 1479; glucose 775.
  - c **Fats:** 689; oils 1376.

16. FERMENTATION:
- a. **Decay and spoiling of foods:** 656; carbon 333.
- b. **Sterilizing and pasteurizing methods:** 1824; 1428.
- c. **Production of alcohol:** 42; vinegar 2022; fermentation 656.

17. PHOSPHORUS GROUP OF ELEMENTS: 1475; 53.
- a. **Phosphates:** 1475.
- b. **Matches:** 1118.
- c. **Fertilizers:** 657.
- d. **Antimony and bismuth:** 80; 220; 1512.

18. THE ALKALI METALS:
- a. **Compounds of sodium:** 1777; salt 1667; borax 246; glass 772; tartaric acid 1872; saltpeter 1667.
- b. **Baking powders:** 159.
- c. **Soaps:** 1774.
- d. **Gunpowder:** 815.
- e. **Spectroscope and flame tests for metals:** 1793; plucker tube 1506.

19. THE ALKALINE—EARTH METALS:
- a. **Calcium:** 305.
- b. **Marble and lime:** 1167; 1071; gypsum 819; Drummond light 555.
- c. **Calcium carbide:** 305; acetylene 6.
- d. **Mortar and cements:** 357; gypsum 819.

20. METALLURGY OF IRON: 1211.
- a. **Cast iron, wrought iron and steel:** 939; 1819; furnace 725; ore-dressing 1235.
- b. **The Bessemer process:** 207; Kelly 995.
- c. **The open-hearth process:** 1820; rolling-mills 1625; foundry 702; flux 687.
- d. **Crucible steel:** 1820.
- e. **Annealing:** 75.

21. COPPER: 452.
- a. **Metallurgy:** 1211.
- b. **Electrolytic purification:** Electrolysis 603; metallurgy 1211.

22. ORGANIC CHEMISTRY: 375.
- a. **Hydrocarbons:** carbon 332; hydrogen 903; petroleum 1462.
- b. **Alcohols:** 42.
- c. **Acids:** 7.
- d. **Aniline dyes:** 73.

PEDAGOGICS

1. **THE TERM IN ITS LARGER SENSE, CONSIDERING EDUCATION AS AN ASPECT OF LIFE IN GENERAL.**
    - a. **As related to environment:** 1437.
        - (1) Environment of the age in which one lives.
        - (2) Environment of one's country and community.
    - b. **The individual factors:** 1437.

2. **PEDAGOGICS IN THE RESTRICTED SENSE AS RELATED TO THE WORK OF THE SCHOOL:**
    - a. **Development of the activities of the child: function of the school:** 1437.
    - b. **Function of the teacher:** 1438.
    - c. **Nature of education:** 1438.
    - d. **Nature of the act of learning:** 1438.
        - (1) By observation.
        - (2) By experimentation.
        - (3) By reasoning.
    - e. **Teaching the art of stimulating and guiding the self-activity of the child:** 1438-9.

THE DIVISIONS OF THE SUBJECT:
- a. **History of Education.**
- b. **Philosophy of Education.**
- c. **School Organization and Management.**
- d. **Methodology.**

HISTORY OF EDUCATION:

1. **VALUE OF THE STUDY OF HISTORY OF EDUCATION:** 584.

2. **FIVE EPOCHS IN EDUCATIONAL HISTORY:** 584.

3. **EDUCATION MIDDLE AGES:** 1695.

4. **INFLUENCE OF THE REFORMATION:** 1695.

5. **INTRODUCTION OF POPULAR SYSTEMS IN GERMANY, HOLLAND, SCOTLAND, FRANCE, ENGLAND AND UNITED STATES:** 1695.

6. **AIMED AT RELIGIOUS ENDS:** 1695.

7. **RADICAL DEPARTURE OF MODERN EDUCATION FROM OLD IDEALS.**
    - a. **In respect to aim:** 584.
        - (1) Progressive ideals.
        - (2) Social efficiency.
        - (3) Vocational training.
        - (4) Extension to all classes.
    - b. **In respect to subject matter:** 584.
        - (1) Enlargement of curriculum.
        - (2) Development in elementary schools.
        - (3) Technical and vocational studies.
    - c. **In method:** 585.
        - (1) Psychology as bearing upon method.
        - (2) Mechanical memory-work displaced.
        - (3) Inductive method.
        - (4) Appeal to powers, instincts and interests of pupil.
        - (5) Correlation of studies: 460.
    - d. **In organization:** 585.
        - (1) State systems in place of religious or private control.
        - (2) Development of public school system under state supervision and support.
        - (3) Large funds for educational purposes.
        - (4) Professional training for teachers.

e. **Elementary Schools:** 1695-96.
- (1) Rise of popular education.
- (2) Influence of Pestalozzi.
- (3) Expansion of curriculum.
- (4) Systems in Germany, France and England.
- (5) Elementary education in the United States.
- (6) Work of Horace Mann.
- (7) Development of the system.

f. **Secondary Schools:** 1701-02.
- (1) Origin and aim.
- (2) Present system in Germany, France and England.
- (3) In the United States.

g. **Academies:** 1702.
- (1) Time when they came in.
- (2) A result of what movement.
- (3) How they in large measure took the place of the grammar schools.
- (4) How they differed from grammar schools in purposes.
- (5) Academies as finishing schools and as schools for the training of teachers.
- (6) Introduction of new subjects of study.
- (7) Prominence of science in the academies.

h. **High Schools:** 1702.
- (1) A development of the academies.
- (2) The first in the United States.
  - (a) The English High School of Boston: 1702.
- (3) How they differed from academies.
- (4) Their public character.
- (5) High Schools as a product of the idea that secondary education should be supported and controlled by the public.
- (6) Their spread over the United States.
- (7) Their number at present.

i. **University Education:** 1986.
- (1) Origin and organization of the modern university: 1986.
- (2) History of universities of Europe: 1987.
- (3) The first American Universities:
  - (a) Harvard: 1988.
    - 1 The time of its foundation.
    - 2 How it received its name.
  - (b) William and Mary College: 2088.
    - 1 Time of its foundation.
    - 2 Men trained here in the Colonial period.
  - (c) Yale: 2120.
    - 1 How it received its name.
    - 2 Time and occasion of its establishment.
- (4) Establishment of the State Universities: 1988.
  - (a) Period of establishment.
  - (b) Government aid in establishing.
  - (c) First state universities.
  - (d) The University Extension movement.
  - (See Index under University).

j. **Rural Schools:** 1697.
- (1) Character and scope in the United States.
- (2) Course of Study.
- (3) Organization and government.
- (4) Support: 1698.
- (5) Teachers: 1698.
- (6) Buildings: 1699.
- (7) Improvement of Rural Schools: 1699.
- (8) Consolidation of Schools and transportation of pupils: 1700.
- (9) Conventions of School-officers: 1700.

- (10) Rural High Schools: 1700.
- (11) Educational Extension: 1701.
- (12) Bibliography: 1701.

k. Summer Schools: 1702.
- (1) Chautauqua type.
- (2) Summer-session of Universities, etc.
- (3) Credit toward degree for work done.
- (4) Training of teachers.

l. Schools for Defectives: 1703.
- (1) Methods for teaching the deaf:
  - (a) Sign language.
  - (b) Manual alphabet.
  - (c) Direct or oral method.
- (2) Methods for the blind:
  - (a) Raised letters.
  - (b) Braille system.
- (3) Methods for feeble-minded:
  - (a) Industrial and kindergarten training.

m. Schools of Commerce: 1703.
- (1) Private commercial schools: 1704.
- (2) Public High Schools: 1704.
- (3) Commercial Schools in Europe: 1703.
- (4) Commercial courses in American Colleges and Universities: 1704.

n. Vacation Schools: 1997.
- (1) An extension of public school system.
- (2) How conducted.
- (3) Study and recreation combined.
- (4) Beneficial results.

o. Industrial Schools: 924.
- (1) A substitute for apprenticeship.
- (2) Advantages over apprenticeship.
- (3) German system.
- (4) Industrial training in public schools.
- (5) Schools of industrial design.
- (6) First public industrial school in U. S.

p. Continuation of Schools: 448.
- (1) Object of continuation work.
- (2) Vocational training.
- (3) Work of Y. M. C. A.
- (4) Continuation schools in Germany, France and other countries.

q. Excursion Schools: 640-41.
- (1) Nature-study excursions.
- (2) Out-door geography work.
- (3) Historical work.
- (4) Visits to public institutions.
- (5) Excursion Schools in Germany.
- (6) Difficulties and advantages in excursion work.

r. Technical Schools: 1879.

s. Trade Schools: 1931.
- (1) Nature and object of trade-schools.
- (2) When and where first founded.
- (3) Courses of instruction.
- (4) Privately endowed.
- (5) Names of principal trade-schools.

t. Kindergarten: 1002-03.
- (1) Outgrowth of great reform movement by Froebel.
- (2) Underlying principles.
- (3) Methods based on child-nature.
- (4) Results based on reports of teachers.
- (5) Thorough training of teachers essential.
- (6) First establishment and wide growth of kindergartens.

- u. **The School Garden: 1690-91.**
    - (1) Outgrowth of school-work.
    - (2) Relation to nature-study.
    - (3) Relation to geography.
    - (4) Relation to esthetics.
    - (5) Relation to the home.
    - (6) Educative effect on pupils.
    - (7) Value to teachers.
    - (8) School gardens in Europe.
    - (9) Relation to manual training.
- v. **Correspondence Schools: 461.**
- w. **American Colleges: 422:23.**
    - (1) Courses of Study.
    - (2) Conditions of admission.
    - (3) Elective studies.
    - (4) Founded to train ministers.
    - (5) Aim greatly broadened.
    - (6) College Fraternities.
    - (7) Athletics.
    - (8) Attendance, instructors and endowments.
    - (9) College entrance-examination board.
- x. **Going to College: 423-24.**
    - (1) Who should go.
    - (2) Value of college course.
    - (3) Result as related to practical life.
    - (4) Selection of college.
    - (5) Universities as compared with small colleges.

II. PHILOSOPHY OF EDUCATION:

1. PSYCHOLOGY FOR TEACHERS:

- a. Its place in the new education: 1557.
- b. Development by Herbart: 1557.
- c. Influence in modifying the method of teachers: 1557.
- d. Inductive method: 1557.
- e. Analytic method instead of synthetic; word method in teaching reading: 1558.
- f. Laws of memorizing and habit: 1558.
- g. Physiological psychology: 1558.

2. APPERCEPTION:

- a. Views of Leibniz, Kant, Herbart: 83.
- b. Interpreting of perceptions by the mind: 84.
- c. Consequences of this principle on education: 84.
- d. How it affects the work of the teacher: 84.
- e. Importance as related to course of study: 84.
- f. Relation of apperception to interest: 85.

3. ASSOCIATION OF IDEAS:

- a. Meaning of the term: 123.
- b. Views of Locke and Hartley: 124.
- c. James statement of the laws of association: 124.
- d. Conditions affecting the law of association: 125.

4. FEELING:

- a. Use of the term subjective: 652.
- b. Relation between feeling and cognition: 652.
- c. Conditions of feeling: 652.
- d. Function of the emotions: 653.
- e. Organic and external expressions of emotions: 653.

5. INTEREST:

- a. Explanation of the use of the term: 931.
- b. Discipline as an educational factor: 931.
- c. Opposing view of Rousseau: 931.
- d. Theory of Herbart: 931.

- e. Influence of Rousseau, Herbart and Froebel on modern education: 932.

6. **CHILD STUDY:**
    - a. Study of mental and physical nature of children in modern education: 384.
    - b. Work of Rousseau, Pestalozzi, Herbart and Froebel: 384.
    - c. Culture-epoch theory of Ziller: 384.
    - d. Theory of G. Stanley Hall: 385.
    - e. Preyer's "The soul of the child": 385.
    - f. Learning by doing: theories of Dewey and Angell: 385.
    - g. Development of perception: 385.
    - h. Place of play in education: 385.

7. **ADOLESCENCE:**
    - a. Transition from childhood to adult life: 14.
    - b. Physical changes characteristic of this period: 14.
    - c. Mental and emotional traits: 15.
    - d. Late adolescence period of change from dependence to independence: 15.
    - e. Called the stress and strain period: 15.
    - f. Professor James' advice: 15.
    - g. Practical problem of the educator: 15.

8. **SELF ACTIVITY:**
    - a. Instincts, impulses and interests: 1720.
    - b. Emphasized by Froebel school: 1720.
    - c. Relation of the will: 1720.
    - d. Self activity basis of the will, effort and interest: 1720.
    - e. How developed: 1720.
    - f. How to be treated by teacher: 1720.

9. **HABIT:**
    - a. Definition of term: 821.
    - b. How distinguished from instinct: 821.
    - c. How habits are established: 821.
    - d. Relation to brain and nerve action: 821.
    - e. Function and value of habit: 821.

10. **MENTAL DISCIPLINE:**
    - a. Value in developing power of mind: 1203.
    - b. Disciplinary value of certain studies: 1204.
    - c. Opposing views of Herbart: 1204.
    - d. Discipline a factor in choosing school curriculum: 1204.
    - e. Value of correlation: 1205.

11. **MEMORIZING:**
    - a. Place in early system of education: 1201.
    - b. Change of method in modern education, but aim the same: 1201
    - c. Memory differs in degree and kind: 1201.
    - d. Methods of memorizing mechanical and associative: 1201.
    - e. Mnemonic systems: 1201.
    - f. Logical associations most effective: 1201.

III. SCHOOL ORGANIZATION AND MANAGEMENT:

1. **WHAT THE SUBJECT INCLUDES:** 1691.
2. **MATTERS CONCERNING THE SCHOOL BUILDING:**
    - a. The erection of the school building: 1699.
        - (1) Selection of the proper site.
        - (2) Aid to be obtained from the state in designing
    - b. School sanitation: 1691-92.
        - (1) What is included in the subject: 1691.
        - (2) Heating and ventilation: 1692.
        - (3) Problem of providing for sufficient light: 1692.
        - (4) Need of having adjustable seats and desks: 1692.

3. **ORGANIZATION AND CONDUCT OF THE SCHOOL:**
    - a. **The course of study:**
        - (1) Correlation of the course of study: 460.
            - (a) What is meant by correlation: 460.
            - (b) The views of Herbart, Froebel and Dewey: 460.
            - (c) Subjects which may most easily be correlated: 461.
    - b. **Discipline and punishment:**
        - (1) Theory of punishment in general: 1562.
        - (2) The proper aim in punishment in school: 1563.
        - (3) Partial solution of the problem:
            - (a) In activity and interest of children in the school: 1563.
            - (b) In self-government: 1563.

4. **THE SCHOOL GARDEN:** 1504, 1690.
    - a. **Relation of the school garden to regular school study:** 1690.
    - b. **Values to be realized by use of garden:** 1691.
    - c. **Relation of the garden to the home of the children:** 1691.
    - d. **Manual training in the care of the school garden:** 1691.
    - e. **The garden in the teaching of nature study:** 1690.

5. **PROBLEMS OF SPECIAL TYPES OF SCHOOLS:**
    - a. **Rural Schools:** 1697.
    - b. **Summer Schools:** 1702.
    - c. **Schools for Defectives:** 1703.

IV. METHODOLOGY.

1. **METHOD IN THE TEACHING OF ARITHMETIC:**
    - a. **The Subject-Matter of Arithmetic:**
        - (1) The essential subjects to be taught in arithmetic: 97.
        - (2) Why it is advisable to drop certain subjects commonly taught: 97.
        - (3) The test of a good topic: 98.
        - (4) What some of the new valuable subjects are: 98.
        - (5) The change in recent text-books: 98.
    - b. **The right aim in teaching arithmetic:** 98.
    - c. **The significance of the answer to a problem:**
        - (1) How far the answer should be emphasized: 98.
    - d. **Value of interest in a problem:**
        - (1) The effect of interest on concentration of attention: 98, 932.
    - e. **Arithmetic teaching in the first two grades:**
        - (1) Informality of the subject in the first year: 98.
            - (a) Reasons for this: 98.
        - (2) How counting should be taught and utilized: 98.
        - (3) Measuring and what it should involve in the first two years: 98.
        - (4) Teaching of fractions:
            - (a) Why teach them early: 98.
            - (b) Devices to make the steps clear: 98.
        - (5) Method in subtraction: 98.
    - f. **Arithmetic in the third, fourth, and fifth grades:**
        - (1) Reduction, ascending and descending: 99.
            - (a) To what this should be confined: 99.
        - (2) Decimal fractions: 99.
            - (a) When decimal fractions should be taught: 98.
            - (b) The best methods of teaching multiplication and division of decimals: 99.
    - g. **Arithmetic in the sixth and seventh grades.**
        - (1) Where the main value in the arithmetic work here lies: 99.
        - (2) Importance of correlation: 99.
        - (3) How to teach percentage: 99.
        - (4) Use of equation in arithmetic: 99.
        - (5) Place and value of oral work: 99.
        - (6) How to emphasize the thought side of a problem: 99.
        - (7) Confusion arising from home help: 100.

2. **METHOD IN THE TEACHING OF GEOGRAPHY:**
    - a. **The scope of the subject of geography:**
        - (1) Definition: 745.
        - (2) How geography differs from physiography: 746, 1482.
    - b. **Geography, how divided:**
        - (1) Physical geography: 745.
        - (2) Political geography: 745.
        - (3) Commercial geography: 745.
        - (4) Medical geography: 745.
        - (5) Oceanography: 745.
    - c. **Geography, its relation to the sciences:**
        - (1) Geology: 747.
        - (2) History: 747.
        - (3) Astronomy: 127.
    - d. **Geography in the first three grades:**
        - (1) The aim here: 746.
        - (2) Geography as incidental to the study of primitive life and nature study: 746, 1308.
    - e. **Geography in the third and following grades:**
        - (1) Geography as a separate subject here: 746.
        - (2) Home geography as the first study taken up; nature study in this: 746, 1308.
        - (3) Importance of emphasis on the causal idea: 746.
        - (4) How the new geography differs from the old: 746.
        - (5) Dynamic character of geography when properly taught: 746.
        - (6) Aids in geography teaching:
            - (a) The magnet: 1145; compass, 435; barometer, 174; dial, 526; thermometer, 1900.
        - (7) The necessity of laboratory and field work: 746.
        - (8) Sources of information: 746.

Note: Refer to Outline on Geography.

3. **METHOD IN THE TEACHING OF HISTORY:**
    - a. **The values of history to be realized: 876.**
        - (1) Main value lies in helping people to understand the present.
        - (2) Instruction which history furnishes in way of human life and character.
        - (3) Furnishing of ideals of conduct.
    - b. **Why the history of one's own country is most valuable:** 876.
    - c. **Beginning of history work in the third grade:** 876.
        - (1) Use of history stories here.
        - (2) Value of skillful story telling.
    - d. **Use of American history as the subject for elementary history:** 876.
        - (1) The divisions of the subject into periods for purposes of teaching.
            - (a) Period of exploration on sea and land.
            - (b) Period of settlement and colonial development to 1763.
            - (c) The struggle with England, the war for independence, the adoption of the Constitution.
            - (d) The growth of the country under the constitution.
    - e. **How to make the history work most valuable:** 876.
        - (1) Select the more interesting and striking phases.
        - (2) Make use of biography to a great extent.
        - (3) Supply by reference books or otherwise, material on customs of the people.
        - (4) Use source materials.
        - (5) Do not make use of long chronological tables.
        - (6) Use charts to get view of contemporary history and historical order: See History Charts: 877.
        - (7) Use population maps and other devices.
        - (8) In upper grades encourage independent study.

Note· Refer to Outline on History.

4. **METHOD IN THE TEACHING OF LANGUAGE:**
    - a. **What is included in language work in school:** 1026.
        - (1) The broad meaning.
        - (2) The narrower meaning.

- **b. The two general problems in language teaching:** 1026.
  - (1) To extend child's power to use language.
  - (2) To correct his language errors.
- **c. Experience at base of all language work:**
  - (1) Varieties of experience to be worked with: 1026.
  - (2) What good language work does for child experience: 1026-7.
- **d. Method in oral and written language:** 1027.
  - (1) Means suggested to assist written work.
  - (2) How the teacher may improve the oral English of pupils:
    - (a) Encourage children to speak freely on interesting subjects.
    - (b) Incidental suggestions correcting mistakes when made.
    - (c) Get pupils to give conscious attention to forms of speech.
  - (3) Formal correction of language errors in upper grades: 1027.
    - (a) Steps in formal correction:
      - 1. Errors recognized.
      - 2. Correct form determined by means of grammar.
      - 3. Correct form made habitual by drill.
- **e. Grammar:**
  - (1) Formal grammar not so important as formerly: 1027, 790.
  - (2) Dependence for correct English on correct use without many rules: 1027.
  - (3) Lack of formal grammar in first six years of school: 1027, 790.
  - (4) Grammar in the seventh and eighth grades: 1027, 791.
    - (a) Pupils usage made the basis for inductive study: 1027, 791.
    - (b) Mainly a matter of classification essential to guidance of oral and written expression: 1027.
    - (c) Language treated as an art, not a science: 1027.
- **f. Foreign languages:** 1027, 791.
  - (1) Oral work: 1028.
  - (2) Written composition: 1028.

5. METHOD IN THE TEACHING OF MANUAL TRAINING:

- **a. What manual training in the wide sense includes:** 1162.
  - (1) Shop and desk work.
  - (2) Domestic science.
  - (3) Domestic art.
- **b. Value in manual training:**
  - (1) Giving of useful skill and knowledge: 1163.
    - (a) Commercial value of manual dexterity.
  - (2) Development of motor control: 1163.
  - (3) Development of observation and judgment: 1163.
  - (4) Values on artistic side: 1163.
  - (5) Object of stick laying, paper folding, tracing, clay modelling and weaving: 1164.
- **c. Desk and shop work:**
  - (1) Desk work in early grades: 1163.
    - (a) Use of ordinary desks: 1165.
    - (b) Working outline lessons for 23 weeks: 1164.
    - (c) Basketry: 179.
    - (d) Drawing: 551.
  - (2) Shop work in upper grades:
    - (a) Materials used: 1165.
    - (b) Tools required: 1163, 1165.
- **d. Domestic Art:** 542.
  - (1) What is included in domestic art.
  - (2) Special values in the subject.
  - (3) The development of taste and skill.
- **e. Domestic Science:**
  - (1) Branches taught: 542.

        (2) Where the emphasis is laid in teaching domestic science: 542.
        (3) Domestic science in the upper grades: 542.
    f. **Industrial schools in relation to manual training:** 924.

6. **METHOD IN THE TEACHING OF MUSIC:**
    a. **The primary purpose of music teaching in school:** 1286.
    b. **Means of accomplishing the purpose:** 1286.
        (1) Experience: imitative singing.
        (2) Classification of ideas and application of musical ideas: sight singing.
        (3) Use of concrete ideas in musical composition.
        (4) Use of musical instruments.
    c. **Method in the first phase of music teaching.**
        (1) Accurate imitation of what is heard and holding it in memory: 1286.
        (2) Classification of ideas: 1287.
            (a) Ideas dealing with interpretation of music.
            (b) Ideas dealing with structure.
            (c) What is taught under each.
        (3) The main difficulty in forming general musical ideas: 1287.
        (4) Importance of doing what is observed: 1287.
        (5) How to clarify ideas obtained.
            (a) Various devices.
    d. **Method in the second and third phases.**
        (1) How the process in the second phase is the reverse of that in the first: 1287.
        (2) The development of ability to conceive of and reproduce motives: 1288.
            (a) Value of instrumental music here.
            (b) Need of careful guidance of pupils.
            (c) Use of pianola and similar instruments.
    e. **General assemblies and festivals in teaching of music.** (See article on The School-Song, 1692.)
        (1) Occasions for festivals.
        (2) Festivals as furnishing motives for music work.
        (3) Combination of music and the drama in the festival.
    f. **Musical Notation:** 1288.
            (a) Art of representing tones by printed characters.
        (1) Structural Ideas:
            (a) Pulse-grouping: 1289.
            (b) Tone-duration: 1289.
            (c) Pitch-representation: 1290.
            (d) Key-signature: 1290.
            (e) How indicated in written music: 1290.
    g. **Harmony.**
        (1) Chord: 838.
        (2) Tonality: 839.
        (3) Melody: 840.
        (4) Key: 840.
        (5) Scale: 840.
    h. **Form in Music.**
        (1) Mode of expression: 694.
            (a) Vocal and instrumental.
            (b) Choral and orchestral.
        (2) Function: 694.
            (a) Secular.
            (b) Ecclesiastical.
            (c) Religious.
        (3) Character: 694.
            (a) Lyric.
            (b) Dramatic.
            (c) Programatic.
        (4) Structural ordering: 694.

    - (5) Melodic material: 694.
    - (6) Illustrative examples: 695, 696.
- i. **Religious Music:** 1284.
    - (1) Essential characteristics: 1285.
    - (2) Importance of association: 1285.
    - (3) Why secular music is inappropriate for religious use: 1286.
    - (4) Type of effective religious music: 1286.
        - (a) Long used for religious purposes.
        - (b) Employing form not adapted to secular use.
        - (c) Effective musically.
- j. **School Song:**
    - (1) Importance of careful selection: 1692.
    - (2) Imitative and dramatic period: 1692.
        - (a) Model selections, with suggestions for teaching: 1693.
        - (b) First step: 1693.
        - (c) Advanced step: 1693.
        - (d) Teaching points to gain expressive use of song: 1693.
    - (3) Investigative period: 1694.
        - (a) First step; use of descriptive songs.
        - (b) Illustrations.
        - (c) Advanced step; songs to promote sight-singing.
        - (d) Illustrations.
    - (4) Constructive period: 1694.
        - (a) Work in upper grades.
        - (b) First step.
        - (c) Advanced step.
        - (d) Illustration.
    - (5) Work in High School: 1695.
        - (a) Difficulties and how to meet them; chorus work.
        - (b) Appropriate selections.
    - (6) General assemblies and festivals: 1695.
        - (a) Festivals.
        - (b) Suggestions for this class of work.
- k. **Musical Tones:** 8.
    - (1) The musical scale: 9.

7. METHOD IN THE TEACHING OF NATURE STUDY:

- a. **Nature Study as a school subject:** 1307.
    - (1) What nature study includes.
      (See outline on Nature Study in "The Student's Manual.")
    - (2) Basis of nature study in interests and activities of children.
    - (3) Importance of nature study in early school years.
    - (4) Relation of nature study to school science.
        - (a) Function of nature study as an introduction to science.
        - (b) How nature study gradually differentiates in the upper grades and high school into geography, botany, physics, etc.: 1308.
- b. **Purposes in teaching the subject:** 1308.
    - (1) Development of perceptive faculties, observation, understanding, memory, judgment and language.
    - (2) Development of genuine love of nature.
    - (3) Extend the child's range of experience.
- c. **The material to be used:** 1308.
    - (1) Principles involved in selection.
    - (2) Materials for study in early grades according to season of the year.
- d. **The key to method:** 1309.
    - (1) Emphasis on function.
    - (2) Continual use of problems both in beginning and continuing study.
- e. **Utilization of vacation experiences of children:** 1308.
    - (1) Subjects for study and discussion.

- (2) Material collected during summer.
  - (a) The school museum.
- **f. Nature Study Excursions: 640-41.**
  - (1) Main purposes:
    - (a) To bring into contact with outside world.
    - (b) To give direct experience.
    - (c) To give reality to study.
    - (d) To make work more objective and concrete.
  - (2) Necessity of seeing objects in their natural situations.
  - (3) Interest in work given by excursions.
  - (4) How the advantages outweigh the disadvantages.
- **g. The camera in nature study:** 1309.
  - (1) Value of camera in excursions.
  - (2) What the camera can do in nature study.
  - (3) The kind of training which use of camera gives.
  - (4) The camera as a source of material for study.
- **h. The school garden in nature study:** 1690.

8. METHOD IN THE TEACHING OF PENMANSHIP:

- **a. The three typical systems of handwriting:** 1445.
  - (1) The slant, the medial, and the vertical.
- **b. Main requirements in teaching penmanship:** 1445.
  - (1) Legibility.
  - (2) Speed.
    - (a) Less demand for this than formerly.
  - (3) Ease.
  - (4) Individuality.
- **c. The first years of penmanship work:** 1445.
  - (1) Little or no penmanship in the first year of school.
  - (2) The first work.
    - (a) Use of the blackboard.
    - (b) Seat work with pencil.
    - (c) Necessity of practice.
    - (d) Use of dictation exercises.
    - (e) The method emphasizing accuracy at first.
    - (f) Method emphasizing form first with accuracy to follow.
  - (3 After the first, personal variations from the model allowable.
- **d. Penmanship made a special subject after the sixth grade:** 1446.
- **e. The important considerations in the seventh end eighth grades:** 1446.
- **f. Individual work in correction:** 1446.

9. METHOD IN PHYSICAL EDUCATION.

- **a. What physical education includes:** 1480.
  - (1) The more general meaning:
    - (a) Physical examination of pupils and students.
    - (b) Personal direction in matters of health.
    - (d) Class instruction in hygiene.
    - (d) Gymnastics and athletics.
  - (2) The more technical meaning.
- **b. Increased importance of physical education:** 1481.
  - (1) Requirements of healthful and successful living.
  - (2) Lack of physical exercise and training in modern conditions of living.
- **c. Physical education as a means of insuring normal development:** 1481.
  - (1) The furnishing of opportunity.
  - (2) By furnishing incentive.
- **d. Means of physical education.**
  - (1) Plays, dances, and games: 734-35.
    (See the psychology of play under "Child-Study," p. 385.)
    - (a) Importance of these compared with gymnastics: 817, 1841.

- (b) Elements and opportunities for these supplied by school subjects.
- (2) Athletics: 131.
- (3) Gymnastics: 817.
  - (a) How formal gymnastics lack in educational values: 1841.
  - (b) Proper use of gymnastics as corrective: 817.

e. The program in physical culture:

- (1) The kindergarten and first years of elementary school: 1481, 1003.
  - (a) Character of exercises.
  - (b) No activities requiring fine adjustments.
  - (c) Place of marching and drill, climbing, swinging movements, games of skill.
- (2) Grammar grades: 1481.
  - (a) Prominence of games and exercises requiring skill.
  - (b) Group games.
- (3) Physical education in early adolescence: 1481.
  - (a) Consideration of individual weaknesses.
  - (b) Emphasis on use of apparatus.

10. METHOD IN THE TEACHING OF READING:

a. Divisions according to aspects emphasized: 1590.

- (1) Beginning reading.
- (2) Thought-reading.
- (3) Appreciative reading.

b. Beginning Reading: 1590.

- (1) What is involved in mastering mechanics of reading:
  - (a) The new and strange printed forms.
  - (b) Oral words.
  - (c) Experiences already within his command.
- (2) The main effort of the teacher in beginning reading.
- (3). The two general methods of approach.
  - (a) The thought-method.
    - 1. What is involved.
    - 2. The main reliance in this method.
  - (b) Phonetic method:
    - 1. Emphasis on pronunciation units which make up words.
    - 2. The theory at the base of this method.
    - 3. Artificial character of phonetic methods.
    - 4. The main phonetic methods.
  - (c) Combination of the phonogram method and the though-method is the best.
  - (d) The final aim.

c. Thought Reading: 1591.

- (1) To what the term is applied.
- (2) Purpose in thought reading.

d. Appreciative Reading: 1591.

- (1) Meaning of "appreciative reading."
- (2) Purpose.

e. Special reading methods in school and special purpose of each: 1591.

- (1) Oral reading.
- (2) Silent reading.
- (3) Individual reading.
- (4) Concert reading.
- (5) Prepared reading.
- (6) Sight reading.
- (7) Intensive reading.
- (8) Extensive reading.
- (9) Supplementary reading.

AGRICULTURE

The study of Agriculture holds a place of large and growing importance, both in our schools and in the work of the successful farmer of today. This outline shows the abundant material contained in THE NEW STUDENT'S REFERENCE WORK, in aid of this study. For the convenience of those who wish further information in any special line, reference is given to Farmers' Bulletins, issued by the government. These Bulletins are sent free to any one who applies for them. Address, Secretary of Agriculture, Washington, D. C.

1. STUDY OF THE SOIL:

a. **Clay soil:** in which the earth particles are very small and hold together 1778; 406.
b. **Sandy soil:** in which the particles are larger and loosely held together 1673.
c. **Loam:** a mixture of sand and clay 1778.
d. **Alluvium:** soil formed by rivers, bottom land 53.
e. **Humus:** decayed organic matter in the soil 898; 1165.
f. **Earthworms:** how they make humus in the soil 575.
g. **Mulch:** a loose top dressing to prevent loss of moisture 331; 1275.
h. **Capillarity in soils:** rising of water through the soil particles 330.
i. **Subsoil:** uncultivated soil below the upper layer 1842.
j. **Dry farming:** method of farming with little rainfall 942.
k. **Transpiration:** amount of water needed by plants 1936.

Consult:

Farmers' Bulletin No. 257 Soil Fertility.
Farmers' Bulletin No. 266 Management of Soils to Conserve Moisture.
Farmers' Bulletin No. 245 Renovating Wornout Soils.
Farmers' Bulletin No. 150 Clearing New Land.

2. FERTILIZING THE SOIL:

a. **Nitrogen:** plant food consumed mostly in growing 1353.
b. **Phosphate:** plant food consumed mostly in fruiting 1475.
c. **Potash:** plant food consumed mostly in seeding and maturing 1537; Ammonia 64; Saltpeter 1667.
d. **Lime:** used for correcting the acidity of soils 1071; 658; Marl 1173.
e. **Manure:** used for getting plant food and humus into the soil 1165.
f. **Fertilizers:** plant foods artificially and commercially prepared 657.
g. **Benefit of live stock on the farm:** 1828.
h. **Compost and green manures:** Cowpeas 470; Pea 1432; Alfalfa 46; Rice 1610.
i. **Nitrogen gathering crops:** 1353; Bacteria 154.
j. **Root tubercles or leguminous plants:** 1633.
k. **Absorption:** why plant food should be soluble in water 5.
l. **Rotation of crops:** benefits of rotation 1636.

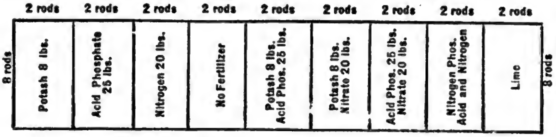
Consult:

Farmers' Bulletin No. 44 Commercial Fertilizers.
Farmers' Bulletin No. 192 Barnyard Manure.
Farmers' Bulletin No. 278 Leguminous Crops for Green Manuring.
Farmers' Bulletin No. 48 The Manuring of Cotton.
Farmers' Bulletin No. 77 Liming of Soils.
Farmers' Bulletin No. 88 Alkali Land.

Plan for Finding What Plant Food Element is Lacking in the Soil.

Lay off 9 plats in a field, 2 rods by 8 rods. Apply a different fertilizer to each plat. Plant corn in each one, and compare the growth and yield of the plats. A more liberal application of fertilizers is used in making this test than would be recommended for general fertilizing.

A chemical analysis of a soil will give valuable information of a general nature regarding the soil; but it cannot be relied upon to determine just what fertilizers should be used. The only way to find out what fertilizers to use on a particular piece of ground is by actual experiment.



3. **DRAINAGE AND IRRIGATION:**
   - a. **Tile and ditch drainage:** 549.
   - b. **Water-table in the soil and how it affects crops:** 549.
   - c. **The reclamation of swamp lands:** 1592.
   - d. **Tile drainage of irrigated land:** 942.

Consult:
Farmers' bulletin No. 263 Practical Information for Beginners in Irrigation.
Farmers' Bulletin No. 187 Drainage of Farm Lands.
Farmers' Bulletin No. 158 How to Build Small Irrigation Ditches.
Farmers' Bulletin No. 371 Drainage of Irrigated Lands.
Farmers' Bulletin No. 138 Irrigation in Field and Garden.

4. **SEEDS AND SEED SELECTION:**
   - a. **Seeds:** names of different parts of a seed 1718.
   - b. **Seed dispersal:** how seeds are scattered 1717.
   - c. **Spores:** the reproductive cells of seedless plants 1803.
   - d. **Germination of seeds:** escape of the young plant from its seed case 760.
   - e. **Embryo:** the young plantlet within the seed 611.
   - f. **Endosperm:** the food in the seed used by the young plant 614.
   - g. **Seed selection:** advantages of practicing seed selection; 31.

Consult:
Farmers' Bulletin No. 306 Dodder in Relation to Farm Seeds.
Farmers' Bulletin No. 253 The Germination of Seed Corn. (Test for Germination.)

5. **VARIOUS FIELD AND GARDEN CROPS:**
   - a. **Corn:** 457.

Consult:
Farmers' Bulletin No. 199 Corn Growing.
Farmers' Bulletin No. 229 The Production of Good Seed Corn.
Farmers' Bulletin No. 313 Harvesting and Storing Corn.

   - b. **Cotton:** 464; **Cottonboll weevil** 465; **Georgia** 753.

Consult:
Farmers' Bulletin No. 217 Essential Steps in Securing an Early Cotton Crop.
Farmers' Bulletin No. 285 Advantage of Planting Heavy Cotton Seed.
Farmers' Bulletin No. 314 A Method of Breeding Early Cotton to Escape Boll-weevil Damage.
Farmers' Bulletin No. 333 Cotton Wilt.

   - c. **Grains and Grasses:** Wheat 2073; Oats 1368; Rye 1650; Buckwheat 283; Barley 172; Flax 682; Linseed 1077; Rice 1610; Sorgum 1782; Millet 1227; Grass 795.

Consult:
Farmers' Bulletin No. 250 The Prevention of Wheat Smut and Loose Smut of Oats.
Farmers' Bulletin No. 132 Insect Enemies of Growing Wheat.
Farmers' Bulletin No. 300 Some Important Grasses and Forage Plants for the Gulf Coast Region.
Farmers' Bulletin No. 219 Lessons from the Grain Rust Epidemic of 1904.
Farmers' Bulletin No. 274 Flax Culture.
Farmers' Bulletin No. 27 Flax for Seed and Fiber.
Farmers' Bulletin No. 322 Milo as a Dry-land Grain Crop.
Farmers' Bulletin No. 110 Rice Culture in the United States.
Farmers' Bulletin No. 101 Millets.
Farmers' Bulletin No. 135 Sorghum Sirup Manufacture.

Farmers' Bulletin No. 279 A Method of Eradicating Johnson Grass.
Farmers' Bulletin No. 248 The Lawn.

d. The Legumes: Nitrogen gathering crops 1353; Alfalfa 46; Cow-peas 470; Clover 413; Pea 1432; Peanut 1434.

Consult:
Farmers' Bulletin No. 339 Alfalfa.
Farmers' Bulletin No. 194 Alfalfa Seed.
Farmers' Bulletin No. 373 Irrigation of Alfalfa.
Farmers' Bulletin No. 224 Canadian Field Peas.
Farmers' Bulletin No. 260 Seed of Red Clover and Its Impurities.
Farmers' Bulletin No. 323 Clover Farming on the Sandy Jack Pine-lands of the North.
Farmers' Bulletin No. 361 Meadow Fescue; Its Culture and Uses.
Farmers' Bulletin No. 315 Progress in Legume Inoculation.
Farmers' Bulletin No. 356 Peanut.
Farmers' Bulletin No. 318 Cowpeas.
Farmers' Bulletin No. 372 Soy Beans.

e. Tobacco: 1918.

Consult:
Farmers' Bulletin No. 83 Tobacco Soils.
Farmers' Bulletin No. 82 The Culture of Tobacco.
Farmers' Bulletin No. 60 Methods of Curing Tobacco.
Farmers' Bulletin No. 343 The Cultivation of Tobacco in Kentucky and Tennessee.

f. Hops: 885; Beer 193.

Consult:
Farmers' Bulletin No. 304 Growing and Curing Hops.

g. Grapes: 794; Wine making 2094.

Consult:
Farmers' Bulletin No. 156 The Home Vineyard.
Farmers' Bulletin No. 118 Grape Growing in the South.
Farmers' Bulletin No. 175 Home Manufacture and Use of Unfermented Grape Juice.
Farmers' Bulletin No. 30 Grape Diseases on the Pacific Coast.
Farmers' Bulletin No. 284 Insect and Fungous Enemies of the Grape East of the Rocky Mountains.

h. Miscellaneous: Potato 1537; Sweet Potato 1855; Yam 2120; Tomato 1921; Onion 1382; Asparagus 121; Cucumis 485; Melons 1291; Pea 1432; Gooseberry 781; Cranberry 473; Strawberry 1837; Raspberry 1587; Currant 488; Mushrooms 1284; Transplanting Vegetables 1937.

Consult:
Farmers' Bulletin No. 62 Marketing Farm Produce.
Farmers' Bulletin No. 255 The Home Vegetable Garden.
Farmers' Bulletin No. 324 Sweet Potatoes.
Farmers' Bulletin No. 282 Celery.
Farmers' Bulletin No. 220 Tomatoes.
Farmers' Bulletin No. 198 Strawberries.
Farmers' Bulletin No. 61 Asparagus Culture.
Farmers' Bulletin No. 176 Cranberry Culture.
Farmers' Bulletin No. 213 Raspberries.
Farmers' Bulletin No. 254 Cucumbers.
Farmers' Bulletin No. 52 The Sugar Beet.
Farmers' Bulletin No. 204 The Cultivation of Mushrooms.

6. FRUIT RAISING AND PLANT PROPAGATION:

a. Horticulture: 887; cross-pollination 482; 1518; Propagation of plants 1552; Plant-breeding 1500; Grafting 789; Layering 1040; Pruning 1555; Hotbed and cold-frame 888; Transplanting 1937; Fruit 721; Apple 85; Peach 1434; Cherry 377; Plum 1506; Sloe or wild plum 1767; Pear 1435; Quince 1575; Paw-Paw 1432; Orange 1388; Lemon 1052; Lime 1072; Citron 402; Grape Fruit 795; Shaddock 1731; Figs 661; Persimmon 1456; Pineapple 1492; Banana 165; Almond 54; Pecan Hickory Nut 872; Chestnut 379; Hazel Nut 853; Walnut 2038; Butternut 297; Mango 1158; Date 505.

b. The canning industry: 323.

Consult:

Farmers' Bulletin No. 154 Home Fruit Garden: Preparation and Care.
Farmers' Bulletin No. 293 Use of Fruit as Food.
Farmers' Bulletin No. 104 Notes on Frost.
Farmers' Bulletin No. 113 The Apple and How to Grow It.
Farmers' Bulletin No. 291 Evaporation of Apples.
Farmers' Bulletin No. 33 Peach Growing for Market.
Farmers' Bulletin No. 140 Pineapple Growing.
Farmers' Bulletin No. 238 Citrus Fruit Growing in the Gulf States.
Farmers' Bulletin No. 332 Nuts and Their Uses as Food.

7. POULTRY:

Poultry: 1540; Duck 557; Goose 780; Turkey 1955; Guinea Fowl 812.

Consult:

Farmers' Bulletin No. 287 Poultry Management.
Farmers' Bulletin No. 236 Incubation and Incubators.
Farmers' Bulletin No. 51 Standard Varieties of Chickens.
Farmers' Bulletin No. 200 Turkeys.
Farmers' Bulletin No. 64 Ducks and Geese.
Farmers' Bulletin No. 234 The Guinea Fowl.

8. DESTRUCTIVE INSECTS:

Special references: Insect 928; Larva 1032; Pupa 1564; Caterpillar 349; Moth 1270; Butterfly 296; Fly 687; Gnat 775; Hessian Fly 870; Galls 730; Tick 1910; Codlin-Moth 419; Hawk-moth 851; Ichneumon Fly 912; Beetles 194; Potato Bug 1537; Carpet Beetle or Buffalo Moth 340; Buffalo Gnat 286; Ladybug or Ladybird 1019; Weevils 2064; Cottonboll Weevil 465; Curculio 2064; Peach Tree Borer 1434; Chinch Bug 389; Grape Phyloxera 795; Worms: Cottonworm 465; Tobacco-worm 1918; Cutworm 491; Cankerworm 322; Onion Maggot 1383; Army Worm 109; Grasshopper 796; Locust 1106; Cicada or 17 year Locust 397; Plant Lice or Aphides 82; San Jose Scale and other scale insects 1686.

Consult:

Farmers' Bulletin No. 155 How Insects Affect Health in Rural Districts.
Farmers' Bulletin No. 264 The Brown-tail Moth and How to Control It.
Farmers' Bulletin No. 275 The Gipsy Moth and How to Control It.
Farmers' Bulletin No. 99 Insect Enemies of Shade Trees.
Farmers' Bulletin No. 120 Insects Affecting Tobacco.
Farmers' Bulletin No. 196 Usefulness of the American Toad.

9. THE FUNGI:

a. **Fungous Plants which take food from other plants or animals: 724; Haustoria 847.**
b. **Symbiosis: the living together of two kinds of organisms 1859.**
c. **Parasites: which obtain food from living hosts 1420.**
d. **Saprophytes: which live in decaying organic matter 1678.**
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f. **Blight: 227; Microbes 1219; Bacteria 154; Mildew 1224.**
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Where is the Pearl Mosque? 26.
Who is said to have swallowed a $400,000 pearl? 1435.
Who built a throne at a cost of $35,000,000? 1732.
When was the first women's rights convention held? 1811.
What place contains more people to the square mile than any other place in the world? 1335.
What vase is considered the finest specimen of an ancient cameo cut glass that is known? 1533.
What is meant by the Golden Age? 778.
What was the Golden Fleece? 778.
What terms are used for husband and wife by the gypsies? 818.
Who was the Man with the Iron Mask? 939.
What marble arch is said to be the finest in the world? 90.
Tradition says that Washington was never known to swear but once. When? 1252.
In what country is absinthe a popular liquor? 5.
What were the shinbones of animals used for in early times? 1763.
What village was made famous by the number of runaway marriages occurring there? 805.
Where is the celebrated Vallombrosa Abbey? 2000.
What was known as the Hudson Bay Company? 893.
What was the famous Edict of Nantes? 896.

What house of rulers, founded in the beginning of the ninth century, has continued an unbroken chain to the present day? 878.
What are the Homestead Laws? 882.
Where are the largest eggs found? 589.
Where is the largest lock in the world? 1218.
When was the period known as the Middle Ages? 1222.
What does the term Dark Ages indicate? 1222.
What cathedral contains 60,000 statues on the outside in the niches? 1223.
What prince was believed by his countrymen to have discovered America three hundred years before Columbus? 1142.
What woman born in prison became the wife of a king? 1151.
What kind of a garment is a poncho? 1525.
What woman was queen for only nine days? 806.
Where is Mammoth Cave, and what is its size? 1155.
Where are the cultivation and use of tobacco forbidden? 1264.
What people call their country the Flowery Kingdom? 389.
In what country are but few drunkards seen, and why? 390.
What great city in ancient days boasted of having no citizen in want? 1526.
What was the first express company? 642.
Where are the Krupp gun works? 627.
What people sent to Darius every third year four pints of gold dust? 629.
What is the origin of "I came, I saw, I conquered"? 2131.
At what place is the shortest day only three hours and twelve minutes, the longest twenty-one hours and forty-eight minutes? 91.
Where is the noted stone circle, Stonehenge? 1832.
What hermit spent thirty years on a tower? 1842.
Who furnished the money for the Suez Canal? 1843.
What was the Rye House Plot? 1650.
Who vainly offered a city for a ruby? 1641.
What is the largest and finest theater in the world? 1898.
In what countries did they have lake dwellings? 1022.
What nations have done most to improve the artillery service? 115.
In what battle were modern arms first used? 107.
Where is the most famous artesian well? 113.
From what ancient city was the obelisk of Central Park in New York brought? 859.
To whom was the name Puritans first given? 1564.
What is known as a Pyrrhic victory? 1567.
What valuable discoveries were made by Sir William Siemens? 1753.
What was the South Sea Scheme? 1787.
What was the Stamp Act? 1808.
In what island did a three years' drouth cause over thirty thousand people to perish? 330.
What is Cooper Union? 450.
Which one of the seven wonders of the world was set on fire the night Alexander was born, and why? 621.
What city founded in the tenth century contains architectural styles of almost every century since? 689.
What were the Crusades? 483.
Who were the Seven Wise Men? 1727.
What were the Seven Wonders of the World? 1727.
Who were the Seven Sleepers? 1727.
What is meant by the term Sealed Orders? 1714.
Where did the famous exploit of the Maid of Saragossa take place? 1679.
At what ancient harvest festival were slaves banqueted by their master while he served them? 1683.
What led to the expression, "Squatter Sovereignty"? 546.
Who was Confucius? 441.
What queen was crowned king? 395.
What nation uses the most beer? 193.
What is the amount of beer used in the U. S. for each person? 193.
What is the largest bell in the world? 197.

Who were the Mutineers of the Bounty? 1494.
What is the greatest piece of blasting the world has ever known? 226.
What is the Phi Beta Kappa fraternity? 1465.
What is the value of a piaster? 1487; 2111. Of a rap? 2111.
Who were the Picts? 1488.
What was the Gunpowder Plot? 816.
What was the Children's Crusade? 483.
What abolitionist received the name of Ossawattomie? 275.
What is international law? 933.
Who were the buccaneers? 281.
What was the Iron Age? 939.
What was the charge of the Light Brigade? 150.
Who wrote the famous line: "Westward the course of empire takes its way"? 203.
What queen married a brewer because she was so much pleased with his dancing? 1949.
When do equinoxes occur? 622.
What people flatten their children's heads? 394.
What city of eighty thousand people has no hotels? 1576.
Where did Punch and Judy originate? 1561.
What is Pompey's pillar? 1525.
What was the Gordian knot? 781.
Who was known as the Red Prince? 712.
What island is called Sailor's Grave, and why? 1651.
What was the Salic law? 1665.
What people use birds' nests for soup? 247.
When and where was the first clearing house established? 169.
What is the highest volcano in the world? 464.
What people allow snakes to come into their home and believe they are ancestors? 1725.
What was the Stone of Destiny? 1707.
When did riddles first come into use? 1613.
What was the largest merchant vessel ever built? 1743.
What place is called the White Man's Grave? 1754.
When did the first system of shorthand come into use? 1747.
When and by whom was the guillotine introduced? 812.
What is a night dial? 526.
What public woman opposed Lincoln's election? 530.
What kingdom had an army of 10,000 soldiers mostly women? 496.
What city is built over a vein of silver? 2128.
Where were lotteries first known? 1116.
What was the origin of lynch-law? 1126.
How small were horses at one time? 639.

DISCOVERIES AND INVENTIONS

What two brothers have conquered the air? 20.
Who is famous as the inventor of wireless telegraphy? 1169.
Whose experiments laid the foundation for wireless telegraphy? 1882.
What telegraph system will send 150,000 words an hour? 1885.
How may drawings and sketches be sent by electricity? 1881.
When and by whom were roller skates invented? 1763.
What did Elias Howe realize from his sewing machine? 1730.
What is the process of electrotype? 604.
What are the Elgin marbles? 605.
What famous inventor is called the "Wizard of Menlo Park," and how did he get his start? 582.
From what fluid was India ink formerly made? 491.
How are the different colors produced in fireworks? 676-7.
What is the difference between an ordinary and an instantaneous fuze? 726.
What is a petard? 1459.
Who first introduced steel as a material for constructing guns? 1013.
When was the first law of patents passed? 1428.
Who is credited with first unwinding a silk cocoon? 1757.
How long does a patent right last? 1428.

Who perfected the Remington typewriter? 1963.
Whose invention was the foundation of the wealth of the cotton-growing states? 2080.
For what is a telemeter used? 1833.
Who is the inventor of the gas motor? 740.
Whose invention was the starting point for our modern rifle? 1614.
When was gun cotton invented? 815.
What nation is thought to have invented gunpowder? 815.
What three important discoveries were made by means of the Coast Survey? 415.
When was the first microscope made? 1220.
When was nitroglycerine discovered? 1354.
What is the Nobel prize? 1354.
What doctor gave us the word "electric"? 596.
Who invented the linotype and monotype machines? 1962.
Who is undoubtedly the inventor of the telephone? 1884.
When were steel sewing needles first made? 1317.
Where are spectacles said to have been invented? 1793.
What electrical discoveries were made by Stephen Gray? 596.
What important improvements were made by Mr. Sprague in 1887 in electric railroads? 601-2.
What discovery of Witt's must rank as one of the important astronomical discoveries of recent years? 126.
What machine is based on the discoveries of Prof. Ferraris of Italy? 601.
What discovery did Copernicus make? 128.
Where was the first electric railway? 601.
Who invented the needle gun, and when? 553.
When was dynamite invented? 568.
What important discovery did Faraday make with electricity in 1831? 568.
Who invented the grand piano? 623.
Whose invention changed the navies and navigation of the world? 1913
What art was invented by Senefelder? 1100.
Who built the first lifeboat? 1067.
Who designed the lifeboat, and when? 1067.
How old is the process of tanning skins, and where invented? 1043.
What is the earliest and simplest form of engraving, and by what country was it introduced? 2106.
How are depths of great bodies of water found? 1783.
When was the first typewriter invented? 1963.
Who invented printing with movable type? 817.
Who invented the process of puddling and rolling? 939.
What is the Bessemer process of making steel? 1820.
Who invented the power loom? 343.
When did balloons come into use? 19.
Who discovered the true cause of the tides, and how? 1911.
In what city have nails been manufactured for 300 years? 1298.
What is the origin of the telephone? 1884.
Who designed and built the first locomotive in America? 450.
Where were the first galley boats made? 455.
When was the first fountain pen used? 1443.
What led Edison to the discovery of the phonograph? 1474.
How was paper first made? 1417.
How is papier maché made? 1418.
When and where was the first life-boat built? 1066-7.
How is parchment prepared? 1420.
What is the process of stereotyping? 1823.
Who invented the first steam hammer? 1817.
Who made the "Rocket" steam engine famous, and who was its builder? 1817.
Who invented the stereoscope? 1823.
When and by whom was stereotyping invented? 1823.
When and where was the first telegraph line laid successfully? 1267
Who was the inventor of glass? 773.
What led to the invention of the spinning jenny? 838.

When and by whom was the first blast furnace worked? 939.
When and by whom was the flint lock gun invented? 814.
Who invented macadamizing, and where first introduced? 1129.
Who invented the spinning mule? 481.
How long has irrigation been practiced? 940.
What was the first cotton mill built in the United States? 465.
Who was the founder of the science of hydrography? 1191.
What important invention did Sir Humphrey Davy make, and what led to the discovery? 1652.
What led to the discovery of the photophone? 1478.
How and by whom was the Silurian system discovered? 1280.
When and by whom was gas invented for use as lighting purposes? 1280.
What is the process of vulcanizing rubber, and who discovered it? 920.
How early was steam used for moving boats? 1818.
What was the first steam vessel to make a voyage? 1818.
What discovery led to the invention of the barometer? 174.
Why are some bricks red and some buff colored? 265.
How is charcoal made? 367.
What led to embalming among the Egyptians? 591.
What is the process of photography? 1476.
In how many seconds will an air brake stop a train going 50 miles an hour? 259.
How are new inventions protected? 1428.

EDUCATION

What college graduated lady physicians in the 12th century? 1987.
May women study at Harvard? 1988.
What college did George Washington endow? 2024.
Where was the degree of bachelor first introduced? 1987.
Who invented our punctuation marks? 1561.
Who discovered the profession of teaching? 945.
What college was founded by Henry VI in 1440? 630.
What was the procession of the boys to Salt Hill for? 630.
Who were the best educated people in Europe in the 18th century? 1708.
Who were the bookmakers and translators of the middle ages? 1063.
What is the oldest university in Germany? 760.
In what strange way have some early manuscripts been discovered? 1412.
Why did Pestalozzi write "How Gertrude Educates Her Children"? 1459.
Who was the founder of comparative geography? 1617.
What was the cause of the Associated Press, and when organized? 123.
What is the largest Catholic institution in the west? 1783, 1990.
What university was founded under the auspices of King George II of England? 1987.
Where is the oldest Scandinavian university? 1987.
What country ranks first in universities? 760.
How many years did Noah Webster spend in preparing the American Dictionary? 2063.
What woman founded a seminary upon the plan of uniting domestic labor with intellectual culture? 1127.
Where and what is the largest library in the world? 1064.
When was the first circulating library started in London? 1063.
What is the school system of Württemberg? 2133.
What university chooses its chancellor for life without a salary? 1405.
Where was the first Sunday School held in America? 1849.
What is the artillery school instituted for? 115.
Where is the oldest university of central Europe? 1987.
What are the characteristics of the universities of England that differ from others on the continent? 1987.
When was the oldest university founded in Germany? 760.

How are the universities of Germany controlled, differing from others? 760.

Where was the first book published in the United States? 313.

What is the Pool of Knowledge? 199.

What is the polite language? 1028.

Who is the greatest of all letter writers? 1058.

When was Webster's Dictionary first published? 2063.

What history is held to be the authority on Chinese life and manners? 2089.

What university in the United States resembles the German universities in its methods? 1988.

What is the oldest university in the United States? 1988.

What was the second college founded in the United States? 2024.

What is the oldest university of Scotland? 1987.

What was the earliest and most famous of the colleges in the middle ages of Paris? 1987.

When and where was the first teachers' institute held? 1877.

What great reformer spent most of his life in perfecting the kindergarten system? 719.

Who formed the Chautauqua assembly? 374.

What country requires every child to have three years' schooling? 1857.

What important educational institute is located in Baltimore? 164.

What state has the largest school fund? 1241.

What university had from 6,000 to 8,000 students in the thirteenth to the end of the seventeenth century and now has only 1,200 students? 1664.

Who established the Working Men's Institute in Brighton? 1620.

What was the first real science or system of political economy? 1517.

When and where was the first polytechnic school established? 1522.

Who was the founder of analytical geometry? 522.

Who was the father of geometry? 631.

Who founded Christ Church College at Oxford, England? 2104.

What empress used her wedding gifts for endowing a college for women? 631.

In what famous college did American missions to the heathen start, and by whom started? 2089.

TEACHING.

How does apperception differ from ordinary perception? 83.

How do Leibnitz and Kant use the term apperception? 83.

What does Herbart teach about experience? 84.

What gives the teacher his clue as to what the child can learn? 84.

How is apperception important to the course of study? 84.

What discovery has given a new development to the idea of apperception? 84.

What is association of ideas? 123.

What does Locke assume regarding this association? 123.

What does Hartley say all mental processes depend upon? 124.

What is the only real explanatory law of association? 124.

How is association of ideas connected with apperception? 124.

How may big trees and elephants be associated? 125.

What do modern psychologists hold of all mental elements? 125.

What is the meaning of the word psychology? 1556.

Can mind or matter be defined? 1557.

Who maintain that mind is the only reality in the universe? 1557.

Who holds that mental acts are qualities of matter? 1557.

What are the three divisions of the mental faculties? 1557.

What lies back of education? 1557.

What is the end of education thought to be? 1557.

What is the most important example of the analytic method of teaching? 1558.

What does the training of the mental powers consist of? 1558.

What is the main business of education? 1201.

What are the two methods of memorizing? 1201.

What is the backbone of effective memory? 1201.

Tying a string around one's finger is called what? 1201.
What is interest based on? 931.
Why has interest been looked upon with suspicion? 931.
What did Rousseau declare? 931.
Why was Rousseau's educational scheme one-sided? 931.
Why do we become interested in things? 931.
What is soft pedagogy? 932.
What does character mean? 932.
What was Rousseau's idea of child education? 384.
What does Herbart require of the teacher? 384.
What was the most interesting conception of Froebel? 384.
Who wrote "The Soul of the Child"? 385.
What is a valuable clew to the interests of children? 384.
How can a teacher get a pupil to learn? 385.
What is the dynamic force of learning? 652.
What is the secret of men's capacity to learn? 385.
Why is the term feeling ambiguous? 652.
What is the relation between feeling and cognition? 652.
How do disagreeable feelings help us? 653.
Can we have emotion without organic sensations? 653.
How is emotion a valuable aid to education? 653.
Why has the study of Latin been advocated? 1204.
How did religious conceptions develop character? 1204.
What is the faculty theory? 1204.
How should all studies justify themselves? 1204.
Will memorizing Shakespeare help to learn the rules of grammar? 1204.
What is the most important use of correlation? 1205.
How is the term imagination ordinarily used? 916.
How does imagination differ from memory? 916.
What is the value of imagination? 916.
Does imagination help the farmer, the mechanic, the milliner? 917.
What will make the pupil critical but not productive? 917.
How is habit distinguished from instinct? 821.
What is habit indispensable to? 821.
How may old habits be broken? 821.
At what age are our habits formed? 821.

MODERN EDUCATION.

What are the five great epochs in educational history? 584.
What is necessary for a liberal professional preparation for teaching? 584.
What is an extremely valuable work in education? 584.
What has been done to disciplinary subjects? 584.
What system of education was created in the 19th century? 585.
Is education in the U. S controlled by the states or by the Federal government? 585.
How many acres of land have been granted for state schools? 585.
What is the most important relation of the school garden? 1691.
Why are normal schools taking up school gardens? 1691.
What great universities have taken up school agriculture? 1691.
What does school organization and management embrace? 1691.
What is school sanitation? 1691.
How many cubic feet of pure air does each pupil need? 1692.
What are school ships? 1692.
What are the three periods of school song work? 1693.
Why should a careful selection of school songs be made? 1692.
What does the song, "Bring the Comb," picture? 1693.
What are the teaching points gained by school songs? 1693.
What are the difficulties of music in high schools? 1695.
What is the function of public school music? 1695.
What are the three essential means for comprehending music? 1286.
How does the second phase of music study differ from the first? 1287.
How should the motif be used? 1288.
How has modern invention helped the study of music? 1288.
What does musical notation deal with? 1288.

What is a key? 1289.
What is the key signature? 1290.
What is the meaning of largo, andante, allegro, presto? 1290.
How was literary education confined in the middle ages? 1695.
When was compulsory attendance established in Germany? 1695.
What idea did the Reformation bring? 1695.
Who were the Brethren of the Christian Schools? 1695.
In the beginning what was the end of popular education? 1695.
In what country must any school have official sanction? 1696.
In what condition were free schools in 1835, in Massachusetts? 1696.
In what way is elementary education superior in Europe? 1696.
How is American education better than that of Europe? 1696.
What are district schools? 1697.
Where are Indian schools? 1697.
What widespread movement is decreasing rural schools? 1697.
How does attendance differ in city and rural schools? 1697.
What are graded schools? 1697.
In what schools is each pupil a class by himself? 1697.
How are rural schools managed? 1697.
What is one of the firmly fixed beliefs of the American people? 1698.
What is the state school tax? .1698.
How were permanent school funds formed? 1698.
What is the most important problem of rural schools? 1698.
Why are few trained teachers found in rural schools? 1699.
What is said of "the little red schoolhouse"? 1699.
How many million children attend country schools? 1699.
Where was the first experiment of centralizing schools? 1700.
What is the plan of consolidation and transportation? 1700.
Does rural education cost more under the new plan? 1700.
What are the benefits of school board conventions? 1700.
What important plan of reform is considered by Congress? 1701.
When will life on the farm be better than any other life? 1701.
What is the aim of secondary schools? 1701.
What are the secondary schools of Germany? 1701.
What took the place of the Jesuit schools in France? 1701.
Where are these schools devoted entirely to the classics? 1701.
Where was the first high school established in the U. S.? 1702.
What difficult situation is the high school in? 1702.
How many high school students complete the course? 1163.
What is the most popular type of summer schools? 1702.
What is unique in the University of Chicago summer school? 1703.
What are the different schools for defectives? 1703.
What is the "sign language"? 1703.
Where were the first American schools for the blind? 1703.
How is commercial education conducted in the U. S.? 1703.
What two cities have high schools of commerce? 1704.
Where are colleges of commerce established? 1704.
Where were correspondence courses first organized? 461.
Is correspondence instruction satisfactory? 461.
What should correspondence students guard against? 461.
What are continuation schools called? 448.
Which state leads in continuation schools? 448.
How many continuation schools conducted by the Y. M. C. A.? 449.
What is one secret of the industrial advance of Germany? 449.
What is correlation of studies? 460.
How would Ziller use the story of Robinson Crusoe? 461.
Where was the first public normal school established? 1355.
What is the most valuable normal school work? 1356.
What four studies should amount to one-fourth of the entire normal course? 1356.
What is sloyd? 1768.
What is the fundamental tool in sloyd? 1768.
In what country did sloyd originate? 1768.
In what city did manual training schools begin? 1162.
Where was the first manual training exhibit in the U. S.? 1162.
What does manual training include in public schools? 1163.

What is the value of manual training on the artistic side? 1163.
What materials are needed for manual training in the first grade? 1163.
What are industrial schools a substitute for? 924.
What did industrial drawing in public schools lead to? 924.
When was the first public system of industrial schools established in the United States? 925.
What are polytechnic schools? 1522.
What is the name of the oldest polytechnic school in the U. S.? 1523.
Are polytechnic schools efficient? 1523.
How has the business college been of immense value? 295.
How have business colleges developed in the last 50 years? 295.
When was the first military school planned? 1224.
How do cadets gain admission to West Point Academy? 1224.
What is the yearly pay of each cadet? 1224.
Where are four special military schools located? 1225.
In what schools is the military drill a feature? 1225.
How has the course of study in American colleges improved? 422.
When were elective students introduced into Harvard? 422.
What are a student's expenses in college? 422.
Why was Princeton founded? 422.
What attention do athletics receive in colleges? 423.
What college had the first college paper? 423.
What is the largest college in the United States? 423.
How many women are going to college in the U. S.? 423.
What is the college entrance examination board? 423.
Where are the examinations held? 423.
How many pupils who fail to gain entrance to college? 423.
Does it profit anyone to go to college? 423.
What great change has taken place in the past 25 years? 423.
What class of persons does one meet in college? 424.
What advantage has the college graduate? 424.
What colleges are now preferred by many enlightened persons? 424.
Why is the average instruction in any college not very good? 424.
How should a college be chosen? 424.
Who established kindergarten schools? 1002.
What is the starting point of the kindergarten method? 1002.
What is essential to success in kindergarten work? 1002.
In what U. S. city was the kindergarten first tried? 1003.
What is the main purpose of school excursions? 640.
Upon what should all studies be based? 641.
In what country does the teacher take a group of boys for a trip? 641.
What are the chief classes of school excursions? 641.
What does self activity mean? 1720.
What are the two principal factors in education? 1720.
Why is self activity encouraged? 1720.
How should self activity be treated by the teachers? 1720.
What are the two periods of adolescence? 14.
What change takes place in thought and feeling? 15.
When are personal habits fixed? 15.
What is the practical problem of the educator? 15.
What are Prof. James' valuable words of encouragement to youths? 15.
What does domestic art include? 542.
How does domestic science differ from manual training? 542.
How long does a normal course in domestic science last? 542.
What branches are taught in domestic science? 542.
What is the purpose of parents' meetings? 1421.
What did the National Congress of Mothers do? 1421.
How may the parent be wiser than the teacher? 1421.
What is the explanation of heredity? 867.
What is the special characteristic of hypnotized persons? 906.
What is the cataleptic state? 907.
What theory of Mesmer has been exploded? 907.
In what diseases is hypnotism useful? 907.
Can hypnotism compel one to commit a crime against one's will? 907.

PEDAGOGICS.

Who was Pestalozzi? 1458.
What does the term pedagogics embrace? 1437.
What forces are always at work in education? 1437.
How does the world spirit influence youths? 1437.
What value has the community spirit? 1437.
What is the true end of formal education? 1437.
What is the specific function of the teacher? 1437.
What faculty sets up ideals and realizes them? 1437.
What does the preparation of the teacher include? 1438.
What is the act of learning? 1438.
What is the highest form of knowledge getting? 1438.
How may the teacher assist the child to learn? 1438.
What is the law of the reaction of perception upon self activity? 1439.
What does the philosophy of education include? 1439.
What is methodology? 1440.
What problems come under school organization and management? 1440.
What are the five great epochs in educational history? 1440.

METHOD OF TEACHING.

What are the three methods of learning? 1877.
What method do the lower animals use? 1877.
What method is used by most intelligent beings? 1878.
What is the purpose in teaching our fellows? 1878.
What is the true motive of learning? 1878.
Why do pupils try to outwit the school program? 1878.
What have reformers of method endeavored to do? 1878.
Upon what does the inductive method rest? 1878.
Describe a lesson unit? 1878.
What is the method of recitation? 1878.
What causes pupils to drop out of school? 1839.
How may education weaken the native self of pupils? 1839.
Why should the children lead in recitation? 1839.
What two factors in study do children recognize? 1840.
Why is there so much dull drill work in school? 1840.
Why should pupils recite by topics? 1840.
Should pupils memorize *everything?* 1840.
What should a teacher always bear in mind? 1841.

TEACHING OF LANGUAGE.

What two problems in language instruction? 1026.
How does good language teaching associate language forms? 1026.
What are the differences between oral and written instruction? 1027.
What is the aim in grammar? 1027.
How is language treated? 1027.
Why do many persons use incorrect forms of speech? 1027.
Why are foreign languages taught in the seventh grade in some cases? 1027.
What are the three aspects cf reading? 1590.
What is the thought method in reading? 1590.
What do phonetic methods teach? 1590.
Are diacritical marks used? 1590.
What is appreciative reading? 1590.
What study is spelling taught with? 1795.
What are the four ways of getting the meaning of a word? 1795.
How is the order of letters fixed in the memory? 1795.

ARITHMETIC.

What change has taken place in teaching arithmetic in late years? 97.
What topics are now omitted? 97.
What change is affecting the problems of the younger pupils? 98.
How does the increased interest of the children help them in their study of arithmetic? 98.
What do many good teachers do in beginning arithmetic. 98.
What devices help to make the steps clear? 98.
Why should counting on the fingers be discouraged? 98.

What is the Austrian method of subtraction? 98.
How does the long division form help in short division? 98.
In what year should a text book be used? 98.
Why should only two denominations be used in compound numbers? 99.
What is the approved form for multiplication of decimals? 99.
How should operations in decimals be limited? 99.
What is the Austrian method of division? 99.
Where is the value in more advanced arithmetic? 99.
How is percentage treated? 99.
Should the term base be used? 99.
How can the difficulty in studying arithmetic be overcome? 99.
How do parents often confuse children in the study of arithmetic? 100.

ALGEBRA.

Who made algebra an independent science? 48.
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What is the length of the entire boundary of the U. S.? 1967.
When it is sunset in Maine, is it sunrise in the U. S.? Where? 1967.
Where are the largest harbors? 1968.
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How far is Cuba from Florida? 1968.
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Where is the water-power of New England created? 1968.
What two rivers have 10,000 tributaries? 1968.
What makes the prairie regions profitable? 1968.
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What are the rivers of the Pacific slope? 1968.
How many miles of inland navigation in the U. S.? 1968.
What are some of the natural and interesting features in beauty, grandeur and variety of scenery? 1968.
What is the climate of the Atlantic states? 1968.
How does the Pacific climate compare with that of Italy? 1968.
What makes the U. S. a world in itself? 1969.
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What minerals give the U. S. first rank in production? 1969.
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How much of the country was originally forest? 1970.
How many acres of forest are there now? 1970.
Where is the heaviest stand of timber on earth? 1970.
What are the most important fish? 1970.
In what industries does the U S. lead the world? 1970.
How much of the world's manufactures come from the U. S.? 1970.
What are the chemical and allied industries? 1970.
How does the U. S. stand in agriculture? 1970.
How many families live on farms? 1971.
What are the bulk of the exports? 1971.

How does cotton compare with corn as an asset in the U. S.? 1971.
How does hay compare with cotton? 1971.
Where is most of the woodland? 1972.
What rank does lumbering hold in the U. S.? 1972.
What port does half of our foreign trade? 1972.
How many miles of canals are used for transportation? 1972.
What is the length of the 38 principal canals in the U. S.? 1973.
How much of the U. S. foreign commerce is carried in foreign ships? 1973.
How much of the world's railways are in the U. S.? 1973.
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Where are the "Bad Lands" of the United States? 1786.
What city in the United States is the first naval stores station and second cotton port of the continent? 1683.
What city in the United States is third in importance as to exports? 1330.
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What state in the Union stands foremost in manufacturing? 1732.
What state furnishes one third of the gold, silver, copper, lead etc. mined in the United States? 1254.
What is the first manufacturing city in the Union? 1332.
What range of mountains have twenty-five peaks, the names of five of them being those of presidents of the United States? 2079.
Why is Oregon much warmer than other places of the same latitude? 1391.
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Which state of the Union was once covered with a great lake? 1786
What is the longest unnavigable river in the United States? 1786.
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How does the watershed cross the state? 1150.
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Where is one of the largest salmon pools in the world? 1150.
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Why is Massachusetts the least agricultural state in the Union? 1185.

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How many minutes does it take to walk across New York City? 1334.
What supports the weight of New York City? 1335.
What are the five boroughs of New York City? 1336.
What are the Palisades? 894.
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Of what importance is Allegheny City? 51.
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How does the Mason and Dixon line bound Maryland? 1181.
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What two canals in Maryland? 1182.
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What is tidewater Virginia? 2023.
What mines of Virginia are the largest in the world? 2023.
What two products are peculiar to Virginia? 2024.
What two natural wonders in Virginia? 2023, 1124.
Why is West Virginia called the Switzerland of America? 2071.
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How does North Carolina compare in size with Pennsylvania? 1357.
Where are the government hatcheries? 1357.
How does it compare with Kentucky for tobacco? 1357.
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Where is the largest tobacco farm in the world? 753.
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What are its most important crops? Minerals? 684.
What is the leading industry of the state? 684.
What are the Florida Keys? 684.
What is the greatest engineering feat of recent years? 684.
What city is built on a coral island? 1001.
What crop is grown in the famous black belt of Alabama? 35.
What rank has the state in iron ore production? 36.
How many miles of navigable rivers? 36.
What is the only seaport of Alabama? 1244.
How are funds raised for the levees in Mississippi? 1240.
What is the most valuable tree? 1240.

How does the cotton crop compare with Texas? 1240.
Why is the state of Tennessee divided into sections? 1889.
Where is the garden of Tennessee? 1889.
What do the mountain caverns contain? 1889.
How is Memphis supplied with drinking water? 1202.
How does the soil of the east of Oklahoma differ from that of the west? 1377.
What is the character of the surface? 1376.
Where are "some of the richest oil fields in America"? 1377.
How is the name of the state of Arkansas pronounced? 100.
What success in the culture of rice has the government had? 101.
Where is the largest oar factory in the world? 101.
What unique distinction has Hot Springs? 101.
Where are the famous whetstone quarries? 888.
How long is the Texas coast line? 1985.
Where does most of the salt used in the state come from? 1895.
How does Texas rank in cotton production? 1895.
Where is the Pan-Handle of Texas? 1895.

THE CENTRAL STATES.

How does Kentucky lead in navigable streams? 998.
How has the climate improved the people? 998.
What is wonderful about the soil? 998.
What is said of the hardwood forests? 998.
What is said of tobacco, hemp and horsebreeding? 999.
What is the shape of Ohio? 1373.
What comment has been made on the climate? 1373.
What beautiful stone does the state produce? 1374.
How many million barrels of petroleum are produced? 1374.
Where is one of the largest rolling mills in the world? 1374.
Why is Cleveland called the Forest City? 409.
What celebrated pottery is made in Cincinnati? 400.
How does the state of Indiana rank in size? 920.
Where is one of the most fertile regions in the world? 920.
How many miles of electric lines? 921.
What prevented Lake Michigan from flowing into the Illinois river? 915.
How deep is the vegetable soil of Illinois? 915.
How does the state rank in railroads? 916.
How much of the U. S. coal fields are in the state? 915.
What caused mail wagons to disappear in Chicago? 382.
What waters originally covered the site of Chicago? 379.
Where is the largest canal lock in the world? 1218.
How much of the total iron ore production comes from Michigan? 1218.
What commercial event happens twice a year in Grand Rapids? 793.
How does Michigan rank as a fruit state? 1219.
What magnificent park is connected with Detroit? 523.
What is most of the surface of Wisconsin covered with? 2098.
What is its rank as a manufacturing state? 2099.
How many dairy cows in Wisconsin? 2098.
Why is Milwaukee called the Cream City? 1229.
What rank does Milwaukee hold as a grain port? 1229.
What three great river systems have their source in Minnesota? 1236.
What is the best wheat in the world? 1236.
Where are the Big Woods? 1236.
Where is the largest primary wheat market in the world? 1235.
What are the Twin Cities? 1661.
What is remarkable about the Red River tract of North Dakota? 1358.
What salt lake in the state has no outlet? 1358.
What is the enormous yield of wheat? 1358.
Where are the Bad Lands of South Dakota? 1786.
What is the principal grain of the state? 1786.
What industries flourish in the state? 1786.
What are nearly all buildings in Sioux Falls made of? 1761.

What is the character of the surface of Iowa? 935.
What are the two hydrographic regions? 935.
How does Iowa rank in the production of corn? 935.
What is the annual production of the brick and clay factories of Des Moines? 523.
Why are there little extremes of heat or cold in Nebraska? 1314.
What is a drawback to manufacturing? 1314.
Where are the railways chiefly located? 1315.
Where is the largest creamery in the U. S.? 1073.
What curious caverns in the state of Missouri? 1341.
Why is the climate marked by extremes? 1241.
What mineral does it produce more than any other state? 1241.
What is the immense income of the Missouri Botanical Garden? 1660.
What important geographical position has Kansas? 988.
What has increased the skill of the Kansas farmers? 989.
Where is one of the most modern beet-sugar factories in the world? 990.
In what industry does Kansas rank first? 990.
How does Kansas stand in wheat production? 990.
What great industry is carried on in Kansas City, Kansas, and Kansas City, Mo.? 991.

THE NORTHWESTERN STATES.

What is the character of the Bad Lands of Montana? 1254.
What curious geyser is in Deer Lodge Valley? 1254.
What makes the climate healthful? 1254.
How does Montana stand in the production of sheep and wool? 1255.
Where is the largest smelter in the world? 1255.
What is the peculiar shape of Idaho? 912.
What makes the scenery varied and grand? 912.
What is the law of the state regarding water supply? 913.
What immense lumber mill at Potlatch? 913.
How does the climate of Washington differ in the west and the east? 2045.
How many Federal forest reserves in the state? 2045.
Through what port does the bulk of Alaskan trade pass? 1715.
What makes the delightful climate of western Oregon? 1391.
For what fruits is Oregon famed? 1392.
Where are the hop farms of Oregon? 1391.
What port leads the world in lumber exports? 1392.
Why is the state of Wyoming not adapted for agriculture? 2115.
What splendid showing is made in wool production? 2115.
Where is Yellowstone Park? 2115.
How large is Yellowstone National Park? 2122.

THE SOUTHWESTERN STATES.

How many groups of mineral springs in the state of Colorado? 428.
How much land did Congress give to the public schools? 428.
How does the state rank in producing hard coal? 428.
What prehistoric remains are in the state? 429.
Where do the breeders of the north and the south meet? 521.
Where are the greatest natural bridges in the world? 1994.
What is the altitude of Utah? 1994.
What is the finest building in Salt Lake City? 1667.
Are there any fish in Great Salt Lake? 800.
How does Nevada compare with other states in population? 1323.
What is irrigation doing for the state? 1323.
What has given a new impetus to mining? 1323.
Where is the hottest and dryest region of our country? 308.
How does the climate of the state of California affect the soils? 308.
Where are the fruit and the gold regions? 309
Where are trees 325 feet high and 120 feet in circumference? 309.
How will the Panama Canal affect California? 310.
What is the Golden Gate? 1671.

TERRITORIAL POSSESSIONS.

How much of the United States territory is in Alaska? 37.
How long is the Yukon River? 37.
How does the Japanese current affect the climate? 37.
How much of the salmon product comes from Alaska? 38.
What was the later name of the Hawaiian Islands? 848.
How does the temperature vary? 848.
What important and valuable position has Hawaii? 848.
What splendid landlocked harbor in Hawaii? 1435.
How many islands in the Philippine group? 1470.
How is the climate in July and August? 1470.
What valuable service is rendered to agriculture by the government? 1470.
What is the chief product? 50.

CANADA.

What does Canada comprise? 316.
Is Canada as large as the United States? 316.
How does the population compare with Belgium's 316.
How many miles between Halifax and Vancouver? 316.
How many miles from Victoria to Dawson? 316.
What countries are in the latitude of its southerly portion? 316.
In what latitude is its most northerly portion? 316.
What does the older Canada comprise? 316.
What are the maritime provinces of Canada? 316.
Where are the eastern provinces? 316.
Where are the central provinces? 316.
What is the Pacific province? 316.
Where does the northern province lie? 316.
How do the summers and winters compare with those of Europe? 317.
How does the Japanese current affect the climate? 317.
Where are precious metals found in abundance? 317.
Where is the Laurentian Range of Hills? 317.
How is the lack of coal in this range replaced? 319.
What three rivers are among the largest in the world? 317.
What is one of the greatest sources of national wealth? 317.
How is the irregular triangle of prairie bounded? 317.
What is Canada destined to become? 317.
What trade has gained 90 per cent in ten years? 317.
What is the total of Canada's exports? 317.
Where is most Canadian wheat shipped to? 317.
How many wood-pulp mills are there in Canada? 317.
What are the chief mining provinces? 318.
What is the value of coal produced yearly? 318.
What makes smelting economical in Nova Scotia? 318.
Where are the only nickel producing localities in the world of any consequence? 318.
What mine contains enough nickel ore to supply the needs of the world for all time? 318.
How is copper produced in these mines? 318.
What mines supply the world with asbestos? 318.
Where are the greatest placer gold-mines in the world? 318.
Where is one of the richest silver camps in the world? 318.
What is the value of silver produced in 1908? 416.
How many miles of the Yukon river are navigable? 2127.
When was gold discovered in the Klondyke River? 2127.
What vegetables grow in Yukon? 2127.
Where is the fishing ground of North America? 318.
How many Canadian fishermen are employed? 318.
Where do the salmon impede the flow of the rivers? 318.
How many government hatcheries are there? 318.
What is the largest steel-arch railway-bridge in the world? 318.

Where will be the largest irrigation system on the American continent? 320.
How much do the settlers pay for irrigation water? 320.
What railway furnishes a highway round the world? 320.
Where is the Canadian Northern Railway? 320.
What will be the total mileage of the Grand Trunk Pacific Railway Co.? 320.
What is the greatest waterway in the world? 319.
When will Canada be the Granary of the Empire? 1160.
What province has no waste country? 39.
In what province is the mean temperature 62.7 degrees in summer and 6.9 degrees in winter? 1682.
Where is the watershed of the Pacific slope? 269.
What province is a vast sanitarium? 270.
Where is one of the best deep water harbors on the Pacific Coast? 2001.
What river in Canada is 2,400 miles long? 1137.
What Canadian province has no hotels? 1017.
Where is one of the chief centers of herring fishing? 1017.
What Canadian territory is named after Sir John Franklin? 708.
What city brings its electrical supply 80 miles? 319.
How much larger is Ontario than the United Kingdom? 1383.
What are the world scenic features of Ontario? 1383.
What are the five leading sources of wealth? 1383.
How do the Great Lakes affect the climate? 1383.
What peninsula is the finest part of Ontario? 1383.
What part is a vast fruit farm? 1384.
What province has no direct taxation for provincial purposes? 1363.
Where are one fifth of Canadian fish caught? 1324.
What is the garden province of Canada? 1547.
Where has an experimental farm been for 50 years? 1548.
How long was Newfoundland the only English colony in America? 1341.
What made England a nation of sailors? 1341.
By whom was Newfoundland colonized? 1341.
Why is it a good naval base? 1342.
Where is an immense game preserve? 1342.
How large is the catch of cod yearly? 1342.
How much is fit for agriculture? 1342.
Where is one of the most valuable iron mines in the world? 1342.
What is the chief center of salmon fishing? 1342.
What are the Banks of Newfoundland? 1342.
What is the nearest port in America to Europe? 1342.
Why are all school examination papers sent to England for marking? 1342.
How does Quebec compare in size with the British Isles? 1571.
Is Montreal nearer to Europe than New York? 1572.
When were the provinces of Alberta and Saskatchewan added to the Dominion? 320.
How are the Northwest Territories governed? 1360.
What do the Northwest Territories comprise? 1360.
How could the Mackenzie river be made the longest inland water-route in the world? 1137.
How is trade carried on in the Mackenzie District? 1138.
What is most interesting about the Keewatin District? 893, 995.
From what province will Canada get iron ore in the future? 1966.
How does the Labrador current benefit the fisheries? 1016.
Why is Quebec cut off from the Atlantic? 1571.
What per cent. of the population of Quebec are Catholics? 1572.
How many square miles of forest land in Quebec? 1572.
How long is Victoria bridge, Montreal? 266.
What beautiful cataract near the Dominion capital? 374.
What makes navigation of the Bay of Fundy dangerous? 724.

What is the most northerly of Canada's great lakes? 798.
What city on the Atlantic is strongly fortified? 827.
What is the largest river in Canada? 1137.
What cataract in Quebec is 250 feet high? 1257.
What portion of Newfoundland is covered by lakes and rivers? 1342.
What does the name Niagara signify? 1345.
What volume of water per minute passes over Niagara Falls? 1345.
What is the estimated amount of power at Niagara? 1346.
Why was Prince Edward Island called a "low and beautiful land"? 1547.
What is the total area of the Rocky Mountains? 1622.
What island is called "the sailor's grave"? 1651.
What is the nearest port in America to Europe? 1658.
Where are the headquarters of the consolidated Six Nations? 260.
How much money has Canada spent on canals? 319.
How high is the head of Lake Superior above the head of tidewater? 1659.
What are the total imports of Canada? Also exports? 317.
How long is the St. Clair tunnel? 1656.
Where is that natural wonder called the "reversible falls"? 1658.
What is the value of cheese exported? 317.
What is the value of the fish catch per year? 318.
How many miles of railway in operation in Canada? 318.
Where is irrigation employed extensively in Canada? 320.
What is the annual value of Canada's timber exports? 317.
How much nickel has been taken from the Sudbury mines? 318.
How much gold has been mined in Canada? 318.
What parts of Canada have supplied the most gold? 318.
What is Canada's coal area? 318.
How much land has Ontario left for settlement? 1383.
What city is at the head of ocean navigation? 1258.
Where is the famous Cobalt mining center located? 416.
How rapidly is Ontario being settled? 1384.
Where is the Agricultural College of Ontario? 810.

MEXICO AND CENTRAL AMERICA.

How large is Mexico? 1214.
What is the length of the coast line? 1214.
What is the one good harbor? 1214.
How high is the tableland of Mexico? 1214.
What peak is 17,540 feet high? 1214.
What is the largest river and lake of Mexico? 1214.
How many salt lakes in the valley of Mexico? 1214.
Where is the region of perpetual spring? 1214.
Where is an extensive field for the botanist? 1214.
What are the 353 species of birds famed for? 1214.
What regions have been exploited for 400 years? 1214.
Why has Mexico been called a "horn of plenty"? 1215.
What are the products of the lowlands? 1215.
Where are coffee and cereals grown? 1215.
How many crops of corn can be grown in a year? 1215.
What is the Department of Promotion? 1215.
What rank does Mexico hold in exporting hides and skins? 1215.
What interoceanic railway was opened in 1907? 1216.
What is the prevailing religion? 1216.
Are all religions tolerated? 1216.
What kind of government has Mexico? 1216.
What ancient people founded the City of Mexico? 1213.
What cathedral was a century in building? 1214.
What drains the valley of Mexico? 1214.
What are the boundaries of Central America? 60.
How does it differ from North and South America? 60.
What are the area and the population? 60.

What is the largest inland lake south of the Great Lakes? 60.
How much rain falls in Panama? 60.
What are the chief products? 60.
What ancient people made their home here? 60.
Which country is a British possession? 60.
Where is the republic of Panama? 1415.
When was the Panama Canal first talked of? 1415.
Why did Panama secede from Colombia? 141.

SOUTH AMERICA.

What are the length and width of South America? 61.
In what direction is it from North America? 61.
What important inlets on the coast? 61.
What mighty range of mountains on the western coast? 61.
What is the highest point on the western hemisphere? 61.
Why have the three vast river systems no parallel? 61.
What lake is over 12,000 feet above tidewater? 61.
How does the rainfall differ from that of North America? 61.
What is the character of the forests? 61.
What is said of the coffee, rubber and wheat of South America? 62.
Where are June, July and August the winter months? 239.
Where is the Amazon 60 miles wide? 57.
What river pours 52,000,000 cubic feet of water into the ocean every minute? 1501.
What is the length of the coast line? 426.
What is the only break in the western range of the Andes? 426.
How do the rivers mostly flow? 426.
What was the value of precious metals taken by Spain in three centuries? 426.
What are the principal exports? 426.
How long is the seaboard of Ecuador? 580.
Where does it rain nearly all the year round? 580.
What is the state religion? 580.
Who are the merchants and landholders? 580.
What place is famous for Panama hats? 580.
What country has a lake whose surface is covered with pitch? 122.
What is the character of the country of Venezuela? 2008.
What links the Orinoco and the Amazon? 2008.
What is the basis of Venezuela's wealth? 2009.
The Inca Indians form what part of the population of Peru? 1456.
How does the length of its coast compare with our Atlantic coast? 1456.
Where is the most elevated tableland in the world, next to that of Tibet? 1457.
How long does it take to travel from Lima to Iquitos? 1457.
How does Bolivia compare in size and population with Illinois and Chicago? 238.
What island was the home of the Incas? 238.
What hinders the development of the mines? 239.
Why is Chile called the shoestring republic? 386.
What is the third largest city in South America? 387.
What is the chief source of the nation's wealth? 387.
Why are the houses of Santiago only one story high? 1676.
The Argentine Republic is 22 times as big as what state? 94.
What is the second largest river system in the world? 94.
Where are the famous wheat fields? 94.
Why will it be one of the great producing nations of the world? 94.
How is Buenos Ayres connected with the U. S.? 285.
What is one of the most fertile regions of South America? 1419.
What is Paraguay tea? 1419.
What is the temperature during the summer months of December January and February? 1419.
How does Uruguay compare with Rhode Island in size? 1992.

What is the character of the country? 1992.
Is Brazil as large as the United States? 261.
What is the most remarkable system of waterways on our planet? 261.
How does Brazil lead in variety of plants? 262.
What is the language spoken? 262.
Who pays the salaries of the Catholic prelates? 262.
What are the five sections of Guiana? 811.
How is British Guiana rich? 811.
Where are the inhabitants gradually diminishing? 811.
To what country do the Falkland islands belong? 648.
Who is called the king of the penguins? 648.
Why has Patagonia disappeared from the map? 1428.

EUROPE.

How does Europe rank in size compared with other continents? 632.
How does it rank as to density of population? 633.
How does Europe compare in size with the United States? 632.
How is Europe divided physically? 632.
What portion of the continent is classed as plains? 632.
In what country is the highest summit? 632.
What sea enters Europe from the Arctic Ocean? 632.
What seas enter from the Atlantic Ocean? 632.
How do the lakes in Europe compare in size with lakes in America and in Africa? 632.
Which is the largest river of Europe? 632.
What is the general climate of Europe? 633.
Does the Gulf Stream affect the climate of western Europe? 633.
What river of Europe contains a passage known as the Iron Gate? 502.
Do certain winds affect the climate of Europe? 633.
Is it probable that most of the fruits now grown in Europe are natives of the country? 633.
To what races of people do the Europeans belong? 633.
What is the prevailing religion in Europe? 633.
What race track in Europe is said to be the most famous one in the world? 622.
For what has the village of Interlaken, Switzerland, become famous? 932.
What is the largest roof in Europe unsupported by pillars? 1408.
What famous hunting grounds have recently been made one of the most beautiful pleasure grounds of Europe? 622.
Where are the finest squares in Europe? 1954.
What is the finest Egyptian museum in Europe? 1954.
What is the most aristocratic watering place in Europe? 335.
What substitute for coffee is used throughout Europe? 757.
What is the largest military post on the Mediterranean Sea? 1923.
What are the most celebrated tunnels in Europe? 1951.
What is the oldest university of central Europe? 1987.
What universities of Europe are on the German model? 1987.
In what country of Europe is education most widely spread? 756.
How many universities are there in Europe? 1987.
For what was the university of Bologna especially celebrated? 1987.
What is the only European nation not having compulsory military service? 108.
What are the most famous objects of grandeur and beauty in the Alps? 55.
What mountains are called the playground of Europe? 55.
What city government controls the opera-houses, theaters and street railways? 283.
Where is the highest inhabited spot in Europe? 634.
What is the third largest city of Europe? 204.
Which is the most thickly populated country in Europe? 195.
Where are found the largest coal-fields of Europe? 756, 1926.

What is Europe's average population to the square mile? 633.
Where is Pompeii? 1524.
Why did the Phœnicians give the name to Europe? 632.
What gives it such an extensive coast line? 632.
Where are the two mountain systems? 632.
What is the center of the mountain system in the south and west? 632.
What waters nearly surround Europe? 632.
What islands cluster around the mainland? 632.
What are the largest rivers. 632.
Where do the myrtle and the date-palm grow? 632.
Where did the plants of southern Europe come from? 633.
Name some of the wild animals of Europe? 633.
What is the best method of classifying the races? 633.
How many languages are spoken in Europe? 633.
What geographical changes were made in Europe in the last century? 635.
What is the longest river of Europe? 2028.
How is the Danube controlled? 503.
Where is the most difficult passage of the Danube? 502.
What is one of the most noted rivers in the world? 1606.
What sea has long been one of the commercial highways of the world? 1360.
What prevents the Mediterranean from evaporating away? 1198.
How many railroad tunnels pierce the Alps? 55.
Where is the Balkan peninsula? 161.

GREAT BRITAIN AND IRELAND.

What are the boundaries of Great Britain? 798.
What is the greatest length of the kingdom? 798.
Why is the geological formation of the country interesting? 798.
What is the greatest natural wealth of Great Britain? 798.
Why has Great Britain one of the healthiest climates in the world? 798.
How much of the world's shipping is done by British vessels? 798.
What countries compose the United Kingdom; what the British Empire? 799.
What are the shape and size of England? 615.
What makes its coast line so long? 615.
How does it compare in size with New York state? 615.
How much of its area is productive? 615.
What are the yearly exports and imports? 615.
When did agriculture represent half the wealth of the nation? 615.
What port has one-third of the foreign trade of the whole kingdom? 1103.
What is the area of London? 1110.
What makes London the wealthiest city in the world? 1111.
What is the North Channel, the Irish Sea and St. George's Channel? 937.
What are the provinces of Ireland? 937.
What is the size of Ireland? 937.
What advance has the country made in recent years? 937.
What makes Dublin one of the most beautiful capitals in Europe? 556.
What is the Cove of Cork now called? 1574.
How does Scotland compare with Indiana in size? 1707.
Why are few places more than 40 miles from the sea? 1707.
How long is the Clyde? 1708.
How many mountain peaks above 3,000 feet? 1708.
How do the cool summers affect agriculture? 1708.
What is said of salmon in Scotland? 1708.
What is the state religion? 1708.
What is the source of Glasgow's prosperity? 772.
Where is Fingal's Cave? 674.

FRANCE.

How does France compare in size with Europe? 703.
How long is its coast line? 703.
What are its boundaries? 703.
What is the length of its land frontier? 703.
What is the character of the southeastern half of France? 703.
What is the highest peak of the Cevennes Mountains? 703.
What other mountain ranges in France? 704.
What two widely different regions about the Cevennes Mountains? 703.
What mountains separate France from Spain? 704.
What famous tunnel leads into Italy? 704.
What are the largest rivers? 704.
What large island on the coast belongs to France? 704.
What proportion of the people live in the country? 705.
What is the high value of an acre of market-gardening ground? 705.
What industries show the artistic taste of the people? 705.
What rank does France hold in silk manufacture? 705.
How is internal commerce carried on? 705.
What university has 18,000 students attending? 706.

GERMAN EMPIRE.

What is the one imperial province of Germany? 756.
Where is the high tableland of Germany? 756.
What is the highest peak in Germany? 756.
What is the character of northern Germany? 756.
What are the drainage basins? 756.
How are the great river systems conected? 756.
Where is the largest iron deposit in Europe? 756.
Where is the largest coal-field in Europe? 756.
Where is one-half of the world's zinc produced? 756.
Name some other natural resources of Germany? 756.
What is used as a substitute for coffee? 757.
Where does the making of toys and wooden clocks flourish? 757
How much beer is brewed yearly? 757.
What is the size of the German mercantile fleet? 757.
How long must a German serve in the army? 757.
Why are Germans called Dutchmen? 757.
What is the density of population in Germany? 757.
What are the largest cities of Germany? 757.
What are the German colonies? 757.
Where is the street called Unter den Linden? 204.
What are the most beautiful gates of Munich? 1277.

AUSTRIA-HUNGARY.

How does it compare in size with Texas? 144.
What is the meaning of the name? 145.
What mountains in Austria-Hungary? 145.
How does the climate vary throughout the country? 145.
What is the only mineral not found in this country? 145
Where are the richest lead-mines in Europe? 145.
What mines were worked by the Celts and Romans? 145.
How many people engage in tilling the soil? 145.
Where is the granary of Europe? 145.
For what animals is Hungary famous? 145.
In what products does Austria lead? 145.
What city leads Europe as a milling center? 145.
How many grades of wheat are used? 145.
Where are half the glass factories? 145.
What does America buy and sell from Austria Hungary? 145.
How long is the Danube's course? 145.
What is the size of the merchant-marine? 145.
How is most of the ocean freight transported? 146.

SPAIN AND PORTUGAL.

What waters wash the coast of Spain? 1788.
How is it separated from Africa and France? 1788.
What islands on the coast belong to Spain? 1788.
What is the area of Spain? 1788.
How many rivers are there in Spain? 1788.
Where are the richest quicksilver mines in Europe? 1788.
What per cent. of the people are engaged in farming? 1788.
What is the character of the Mediterranean shore? 1788.
What is one of the principal exports? 1788.
What are the chief cities of Spain? 1788.
What are the length and breadth of Portugal? 1534.
What is the total area with the Azores and Madeiras? 1534.
How far are the Azores from Portugal? 149.
For what has the island of Madeira long been noted? 1141.
How does the population of Portugal increase? 1534.
What is the most important mountain range in Portugal? 1534.
What do the ocean breezes do for the climate? 1534.
What is the condition of agriculture? 1534.
What is port wine? 1534.
Where are the manufactures located? 1534.
What are the chief mineral products? 1534.
How long must each male Portuguese serve in the army? 1534.
Where is one of the oldest universities in Europe? 1534.
Where was one of the greatest earthquakes on record? 1079.
What city in Portugal has a crystal palace? 1387.

ITALY.

How are the limits of Italy strongly defined? 946.
What is the shape of the peninsula? 946.
What is the character of northern Italy? 946.
What are the great plains of Italy? 947.
What mountain systems in Italy? 947.
What are the most remarkable volcanoes? 947.
Are the Italian rivers navigable? 947.
What are the famous mountain lakes? 947.
What noted marble comes from Italy? 947.
What is the character of the people? 947.
How many of the people are engaged in agriculture? 947.
What are the main products? 947.
What is the state religion? 947.
How does the navy of Italy rank? 947.
Why must Rome import all the necessities of life? 1630.
What famous plant that once grew in Egypt now grows in Sicily? 1418.

RUSSIA.

How large is the Russian Empire compared with the continent of Europe? 1645.
European Russia is what part of the whole empire and contains what portion of the population? 1645.
What ocean was the whole sea coast of Russia till the end of the seventeenth century? 1645.
What sea coast is now of chief importance to Russia? 1645.
What is the principal range of mountains? 1645.
What large rivers flow north, and which flow south? 1645-6.
How wide is the plain crossing central Russia? 1645.
What two great rivers have been connected by a canal? 1646.
What are the four chief cities of Russia? 1646.
What races of people make up the population of Russia? 1646.
What kind of a government has Russia? 1647.
To how many boards is the administration of the empire intrusted, and what power has each board? 1647.
The peasant class are what portion of the population? 1646.
What minerals are found in Russia? 1646.

What are the chief articles of export? 1646.
What is a great help to the inland trade? 1646.
What is the monetary value of manufactured products? 1646.
What part of Siberia is very fertile and is the granary of the country? 1750.
When was the trans-Siberian railroad opened? 1750.
What is the climate of Siberia? 1750.
How many degrees below zero has the thermometer been known to register? 1750.
What town is called the Manchester of Poland? 1107.
In what two continents does the Russian empire lie? 1645.
What are the main divisions of Russia? 1645.
What part of the land surface of the globe is Russia? 1645.
What is the present seaboard of Russia? 1645.
Where is one of the finest roadsteads in the world? 1645.
Where are the chief Russian seaports? 1645.
What does the Caspian sea furnish to Russia? 1645.
What immense plain crosses European Russia? 1645.
What rivers rise in this plain? 1645.
What is the population of Russia? 1646.
What are the five classes of the Russian people? 1646.
What makes the wide diversity of climate? 1646.
Where are the minerals found in Russia? 1646.
How much of the land belongs to the peasants? 1646.
How many miles of canalized rivers? 1646.
What is the war-footing of the army? 1647.
What was the extent of the former kingdom of Poland? 1512.
What is the meaning of the word Finland? 674.
What canal runs through granite rock in Finland? 675.
Why is Caucasus called the mountain of languages? 353.
What separates the Russian and English possessions in Asia? 1955.
What is the coldest country in the world? 1749.
What are the tundras of Siberia? 1750.
How was the barrier of Lake Baikal overcome in building the Siberian railroad? 1751.
What is the chief naval station of Russia in Siberia? 2026.

SCANDINAVIA.

What countries belong to Denmark? 520.
What are the boundaries of Denmark? 520.
How does the skai damage the crops? 520.
What is the commonest tree in Denmnark? 520.
What is the value of the fisheries? 520.
How much good soil in Denmark, and how many farmers are there? 520.
Are the Danes well-educated? 520.
To what church must the king belong? 520.
What separates Norway from Sweden? 1361.
Who are the only inhabitants of the mountains? 1361.
How does the Gulf Stream affect the climate? 1361.
What is the main occupation of the people? 1361.
What is the condition of the mineral wealth? 1361.
What interesting establishment in Christiania? 395.
What are the length and width of Sweden? 1854.
Where are the timber-lands and good pasturage of Sweden? 1854.
Where are the iron-mines and copper works located? 1854.
How much of the surface do the lakes cover? 1854.
How long between summer and winter? 1854.
To what extent is grain raised? 1854.
How much of the land is covered by forests? 1854.
How do the soldiers pay for their support? 1854.
What is the national religion of Sweden? 1854.

GREECE.

What is the geographical location of Greece? 800.
How are its provinces divided? 800.
What is the area of Greece? 801.
What mountains on the north separate it from the rest of Europe? 800.
Name some of the islands which are formed by an extension of the mountains forming the northern boundary? 800.
What can you say of the rivers, their size and direction? 800.
To what race of people do the Greeks belong? 801.
What are thought to have been the habits of the early Greek tribes? 801.
From what direction is it thought that the early tribes entered Greece? 801.
By what name did those early tribes call themselves? 801.
By what name does Homer speak of the early tribes? 801.
To what language is that of the Greeks closely allied? 801.
What is the earliest account we have of the Greeks' religion? 801.
What was the form of their worship? 801.
What is the modern Greek church called? 801.
How is the Greek church supported? 801.

TURKEY.

What countries are comprised in the Ottoman Empire? 1955.
What are the total area and population of these countries? 1955.
What races make up the Turkish subjects? 1955.
What are the largest salt lakes? 1956.
What are the principal mountain ranges? 1956.
What is the climate of the country? 1956.
What flower is extensively cultivated? 1956.
Are the resources of the country well-developed? 1956.
What is the religion and law of Turkey? 1956.
How is the sultan regarded, and how great is his power? 1956.
To what extent is polygamy practiced? 1956.
What attitude does the government take toward education? 1956.
Who is the grand vizier? 1956.
Who is the Sheik-ul-Islam? 1956.
Who is the present sultan? 1956.
How many sultans have there been since the conquest of Constantinople? 1956.
Of whom are military services required? 1956.

HOLLAND.

Where is Holland situated? 878.
Is Holland above or below the level of the sea? 878.
For what double purpose are the canals used? 878.
What double purpose is served by the dikes? 878.
What are the chief agricultural industries? 879.
What are its chief manufactures? 879.
What has lately become an important item of manufacture? 879.
In what has Amsterdam the largest trade in the world? 879.
What city is the capital of Holland? 879.
What island possessions has Holland in the East Indies? 879.
In the West Indies? 879.
What are the three largest cities in Holland, not including The Hague? 879.
Who is the present ruler of Holland? 879.
What is Holland's busiest port? 1637.

SWITZERLAND.

Locate Switzerland. 1857.
What is said of the surface of Switzerland? 1857.
Which are the principal mountain chains, and what may be said of them? 1857.

Give the location and area of the plain of Switzerland. 1857.
What hill country lies to the east of this tableland and between what waters? 1857.
What are the main divisions of northern Switzerland? 1857.
Into what is the Alpine region divided? 1857.
By what rivers are the valleys of Switzerland drained? 1857.
By what are the higher mountains covered? 1857.
What is said of the glaciers? 1857.
Where is the lowest part of Switzerland? 1857.
What is said of the forests of Switzerland? 1857.
How are the trees, cut on the heights, conveyed to the valleys below? 1857.
What is the chief business of the people of Switzerland? 1857.
In what part of Switzerland is farming carried on? 1857.
Where are the manufactures chiefly carried on? 1857.
What is said of trade in Switzerland in proportion to population as compared with that of other European countries? 1857.
What are the chief imports? 1857. Exports? 1857.
How is Switzerland governed? 1857.
What is said of the Federal legislature of Switzerland? 1857.
By whom is the president of the republic elected? 1857.
By whom is most of the land owned? 1857.
What are the military requirements of Switzerland? 1857.
What languages are spoken in Switzerland? 1857.
What cities are the centers of the Protestant part of Switzerland? 1857.
What is the population of Switzerland? 1858.
Where does Catholicism prevail? 1857.
What are the educational requirements of Switzerland? 1857.
What is said of the higher and specialized schools? 1857.
What is said of the postoffices, railroads etc. of Switzerland? 1858.
Under whose control are they? 1858.
Name the chief towns of Switzerland. 1858.

ASIA.

How does the continent of Asia rank in size? 119.
What does the name mean? 119.
What portion of the land area of the world is in Asia? 119.
Which is the greatest mountain system of Asia? 119.
What portion of Asia's area is in its peninsulas? 119.
What three large peninsulas are in southern Asia? 119.
What sea bordering Asia on the southwest has become a highway of the first importance? 119.
What two great tablelands has Asia, and what is their location? 119.
What three inland bodies of water has Asia? 119.
What are the names of several of the larger rivers of Asia? 119.
What is the location of the islands relative to the southeastern coast? 119.
What are the chief productions of Asia? 119.
To how many different groups do the people of Asia belong? 119.
What important junction does Allahabad form? 51.
What city is surrounded by a mud wall 24 feet high? 237.

INDIA.

What five natural divisions has India? 918.
What large river systems has India? 918.
How many well-marked seasons has India, and what are they? 918.
Of the domesticated animals what ones do the work of agriculture? 918.
What domestic animals are held sacred? 918.
Of the wild beasts, which one is the most feared? 919.
What are the chief agricultural crops? 919.
What portion of the country is available for farming? 919.

What European country has the greatest trade with India? 919.
Politically, India is a dependency of what nation? 919.
For purposes of administration, India is divided into how many great divisions? 919.
What is the occupation of two-thirds of the people? 919.
To what religion do most of the people belong? 919.
How early were modern missions established? 919.
What city of India is entered by metaled roads through thirteen gates? 1021-2.
What famous palace has made Delhi, India, noted? 517.
Why do the Hindoos refuse to kill the cobra? 417.

JAPAN.

What is the wealth of Japan, and what is the national debt? 964.
How much of Japan's trade is carried on with the United States? 964.
What has made navigation safe? 964.
What is the mileage of the railways? 964.
How do the chief cities compare with Chicago, Milwaukee, San Francisco and New Orleans? 964.
What is said of cloisonne? 965.
Which industries are increasing, and which are decreasing? 965.
What country is under the protection of Japan? 1157.
What naturally impregnable naval station now belongs to Japan? 1529.

CHINESE EMPIRE.

By what name do the natives call their kingdom? 389.
What provinces or divisions has the empire? 389.
What emperor, B. C., formed China from eight kingdoms into one great empire? 384.
What is the most extensive mountain range, and of what great mountain system is it a spur? 389.
How does this mountain range divide China? 389.
What is that portion of China between this range of mountains and the Great Wall called? 389.
Describe the earth covering most of this great plain. 389.
What part of China is called the granary of the nation? 389.
What two rivers are the largest in China? 389.
What name is given the river Ho because of its many floods? 389.
What canal joins the northern and southern parts of the empire, and when was it built? 389.
How long is the Great Wall? 389.
How does the emperor open the farming season, and how does the queen start the work among the silkworms? 390.
How long has the silkworm been cared for in China? 390.
What articles are used as food, not common in European countries? 390.
What is the great beverage? 390.
What are the best buildings seen? 390.
Has China's mineral wealth been developed? 390.
What manufactured article is superior to any made in the west? 390.
What two articles are the chief ones of export? 390.

AUSTRALIA.

To what European power does Australia belong? 142.
What is the size of Australia? 142.
What ranges of mountains are found in Australia? 142.
What river is the only large one in Australia? 142.
What is the nature of a large part of the interior? 142.
Where is the lake district, and what are the four largest lakes? 142.
What is the general climate of Australia? 142.
Do the native people differ from those of other continents? 142.
What is the chief occupation of the natives? 142.
What is their sense of right and wrong? 142.
How many political divisions has Australia? 143.

What new form of government went into effect the first day of this century? 143.
What portion of the people are agriculturists? 143.
What are some of the exports? 144.
What city is the largest in Australia? 143.
What city has a first class naval station? 144.
Why was the Australian ballot system invented? 144.

AFRICA.

What are the greatest length and the greatest width of this continent? 22.
How is it joined to Asia on the northeast and separated from Europe on the northwest? 22.
What seas surround Africa? 22.
What is the northern end of the continent? 22.
What mountains run parallel to the Mediterranean coast? 22.
What have recent explorations determined about the Sahara desert? 22.
What region south of the Sahara? 22.
How is the southern end of the continent marked? 22.
What are the great rivers of Africa? 23.
What is the drainage area of the Nile? 23.
Where are the great lakes of Africa found? 23.
What is said of the climate of Africa? 23.
What is the most fatal region for Europeans and Americans? 23.
Where are the minerals found? 23.
What animal has, it is said, never been domesticated? 23.
Have they ever been domesticated? 604.
What fly's bite is fatal to cattle? 23.
Where are the Hottentots and the pygmies? 23.
What states of Africa are more or less independent? 23.
What nations have colonies in Africa? 24.
What is the total area of the British colonies? 328.
What is the principal harbor of Cape Colony? 328.
What forms the watershed of the country? 328.
How does the eastern part differ from the western part? 328.
Why has the Cape long been known as a health resort? 328.
Describe the immense reservoir that is used for irrigation. 328.
What did the natives formerly use instead of tobacco? 328.
What has become of the native animals? 328.
What birds are found here? 328.
How large is the Kimberly diamond mine? 329.
What are the principal exports and imports? 329.
How many miles of good roads and railroads in Cape Colony? 329.
What are the chief towns? 329.
What modern improvements in Cape Town? 330.
How does the Transvaal compare with Arizona in size? 1937.
What does the land of the Transvaal mainly consist of? 1937.
What makes the climate dry? 1937.
What is the character of the soil? 1937.
What industry is supreme? 1938.
What is the Orange River Colony? 1389.
What is the occupation of the Basutos? 180.
What are the products and imports of Natal? 1305.
Where has asbestos been discovered? 2137.
What is the Central Africa Protectorate? 24.
Why was it founded? 1366.
What are the five provinces of Uganda? 1964.
What is killing off the people of Uganda? 1964.
How many miles of postroads and railroads in Rhodesia? 1607.
What are the products of Nigeria? 1349.
What town has a fine and safe harbor? 1021.
What three countries own Somaliland? 1780.

What country with 32 miles of coast extends inward 335 miles? 1920.
What is the second longest river in the world? 1351.
What lake forms the reservoir for the Congo River? 442.
What country controls the trade of the Niger River? 1349.
How much of the Zambezi River is navigable? 2129.
Is Lake Victoria considered the source of the Nile? 2020.
What is the Assuan Dam? 125.

EGYPT.

How far up the Nile does Egypt extend? 590.
What is the main feature of the country? 590.
What part of the country is called lower Egypt? 590.
Into how many divisions is Egypt divided? 590.
What peculiarity has the Nile valley with reference to rain? 590.
At what season of the year does the Nile begin to rise? 590.
How is the course of the river broken? 590.
What are the chief agricultural crops of Egypt? 590.
What fruits are found in Egypt? 590.
What religion prevails in Egypt? 590.
What three gods were found all over ancient Egypt? 590.
For what purpose were the pyramids used? 591.

GEOLOGY

Who was the father of American geology? 1139.
With what does the science of geology deal? 747.
Why is the idea that geology deals with rocks only, inadequate? 747.
In working out the history of the earth, what has been the line of approach? 747.
How is the land carried away into the sea? 747.
How are sandstone and shale then formed? 747.
What is inferred from this? 747.
From what other sources do geologists learn to interpret rock formations? 747.
Where do geology and astronomy meet? 747.
What is the rival to the nebular hypothesis? 747.
What does it affirm? 747.
What are the three great classes of rocks? 747.
What are the three great agents in the metamorphism of rocks? 748.
What does dynamic geology deal with? 748.
What does petrography deal with? 748.
How may structural geology be defined? 748.
What does physiographic geology deal with? 748.
With what other divisions of the subject is it connected? 748.
What is dealt with in paleontologic geology? 748.
Why is historic geology a broad phase of the subject? 748.
Why is economic geology a practical phase of the subject? 748.
What are the five eras of geologic time? 748.
What was formed during the Archean era? 748.
What formations were deposited during the Proterozoic era? 748.
How long is this era supposed to have been? 748.
What systems of rocks were deposited during the Paleozoic era? 748.
How are these systems distinguished from one another? 749.
How great was the range of life in the Cambrian period as compared with that of the present? 749.
In what period have fish remains been found? 749.
What period is known as the Age of Fishes? 749.
During what period were the great coal deposits made? 749.
When did reptilian life begin? 749.
How is it known that the relations of sea and land differed at different times? 749.
Does it appear that the deep sea bottom has ever been land? 749.
What life existed in the Mesozoic era? 749.
In what period of this era were reptiles the dominant type of life? 749.

What period do mammals date from? 749.
In what period do remains of birds appear? 749.
When were the chalk deposits made? 749.
When did modern types of plants and fishes appear? 749.
What is the Cenozoic era? 750.
Why was the Pleistocene period remarkable? 750.
Where were the ice sheets developed? 750.
What various conjectures have been made concerning the age of the earth? 750.
How are the ages of the various eras thought to compare? 750.
What has been the character of the climatic changes? 750.
What may be said as to volcanic activity? 750.

PALEONTOLOGY.

What does paleontology deal with? 1409.
What are the three divisions of the science? 1409.
Do all the systems of rocks contain fossils? 1409.
What is it the province of paleontology to determine? 1409.
What is involved in the first point? 1409.
What is meant by cosmopolitan faunas and colonial faunas? 1410.
What is involved in the second point? 1410.
What does the third point consider? 1410.
What would a complete knowledge of paleontology involve? 1410.
How does paleontology aid in determining the age of rock formations? 1410.
What is paleontologic geology? 1410.
What is paleontologic zoology? 1410.
What is paleontologic botany? 1410.
Are all animals and plants of higher types than their ancestors? 1410.
Is evolution ascent or differentiation? 1410.
What is differentiation? 1410.
Does the succession of fossils demonstrate the doctrine of evolution? 1410.
Why is present knowledge of ancient life very far from complete?1410.

HISTORY

EGYPT.

What was the condition of the Egyptians when they first became known in history? 591.
What system of writing had they? 591.
Why is the early history dated by dynasties? 591.
Who founded the city of Memphis? 591.
What marks the site of the ancient city today? 1202.
What was the duration of the first dynasty? 591.
Who built the pyramids of Ghizeh? 591.
How many pyramids are there in Egypt? 1565.
How large is the Sphinx? 1797.
When did the shepherd-kings arise? 591.
What famous Hebrew of Scripture was prime minister to one of these kings? 591.
What is the capital of these kings called in the Bible? 906.
How did the kings of Egypt get the name of Pharaohs? 1464.
What are the most famous ruins in Egypt? 1898.
Who raised Egypt to its highest point of glory? 591.
What inscription did Rameses I have over his library door? 1063.
Under what king did the Israelites depart out of Egypt? 1585.
In what dynasty did Egypt come into touch with Greece and Judea? 591.
Who planned the Suez Canal and conquered Palestine? 591.
How was Moses reared? 1269.
When was Egypt conquered by the Persians? 591.
How did Cambyses die? 313.

What was the condition of agriculture among the ancient Egyptians? 26.
What system of writing had they? 591.
What American people used the same kind of writing? 873.
What sciences did the Egyptians know? 591.
What is the proof of their engineering skill? 591.
What mechanical tools were invented and used? 591.
How was papyrus made 1418.
What did it cost to embalm a body in ancient Egypt? 1277.
Why did the Egyptians embalm their dead? 591.
What were pyramids, obelisks and sphinxes used for? 591.
What are "Cleopatra's Needles"? 1368.
What animal was especially sacred among the Egyptians? 591.
How was the key to their hieroglyphics first obtained? 1635.
How did their artists always represent the king? 668.
When was Alexandria founded? 591.
How did Sostrates deceive the king who built the famous lighthouse? 45.
What was the largest collection of books ever gathered before the invention of printing? 46.
What battle marked the end of Cleopatra's reign? 591.
Who placed Cleopatra on her throne? 408.
When and by whom was Cairo founded? 591.
How far are the pyramids from Cairo? 304.
Who were the Mameluke kings? 1154.
Who introduced the beginnings of European civilization? 592.
Under what ruler was the Suez Canal cut? 592.
What ruler suppressed the slavetrade? 592.
Since when has England had a controlling influence in Egypt? 592.
What was the unfortunate end of the brave Gen. Gordon? 592.
What valorous general has reconquered Sudan? 592.
When was Sudan declared open for general traffic? 1843.

BABYLONIA.

What made Babylon the most fertile spot in Asia? 152.
What did the Babylonians know of irrigation? 940.
How have we gained our knowledge of ancient Babylon? 152.
When did boys become free citizens? 152.
What privileges did women enjoy? 152.
How far back does Babylonian history go? 152.
When did Babylon become the capital of the empire? 152.
Who was one of the greatest of ancient monarchs? 1315.
What people did he carry into captivity? 153.
Why did the people revolt against Nabunaid? 153.
When and by whom was Babylon captured? 153.
How has Babylon been successively ruled? 153.
How was the city of Babylon built? 152.
What is the finest work in Babylonian literature? 1080.

ASSYRIA.

How did we learn the history of Assyria? 1352.
What description does Jonah give of the city of Nineveh? 1352.
Who was the real founder of the first Assyrian Empire? 125.
When did the empire decay? 125.
What king again established the power of Assyria? 125.
Who usurped the throne and what tax did he levy? 126.
Who carried away 27,000 of the best citizens of Samaria? 126.
Who was Assyria's greatest king? 126.
How is Sennacherib mentioned in the Bible? 126.
When did the kingdom reach its greatest height? 126.
What present town is near the ruins of Nineveh? 126.
From what place have many Babylonian records been shipped? 126.

What was the development of art in Assyria, Babylonia and Chaldea? 668.
Why were Assyrian boys educated at home? 1081.

THE HEBREWS.

How long have the Hebrews been called Jews? 971.
Where did the Hebrews first settle? 971.
How long did they remain in Egypt? 971.
When did Moses lead them out of Egypt? 971.
Under what leader did they enter the land of promise? 971.
How was the tribe of Levi provided for? 971.
What is the heroic age of Hebrew history? 972.
Who were the greatest of the 15 judges? 972.
Who were the greatest Hebrew kings? 972.
Who founded the lyric poetry of the Hebrews? 507.
What madness seized Saul? 1683.
Why was Solomon's reign a splendid failure? 972.
Who were the Samaritans? 972.
How long did the exile of the Jews last? 972.
What heroic family drove out the Syrians? 972.
What Roman captured Jerusalem? 972.
When did the Jews get the rights of Roman citizens? 972.
When was the temple at Jerusalem destroyed? 972.
What has been the history of the Jews since their dispersion? 973.
How are the Jews now distributed throughout the world? 973.
Who is placed next to Moses in Jewish literature? 1081.
Name some noted Jews in literature, science and public life? 1082.
How did the Jews divide the Scriptures? 209.
What saved the life of Josephus the Jewish historian? 979.

THE PHŒNICIANS.

What was the extent of Phœnicia? 1473.
Where did the Phœnician settlers come from? 1722.
When did Sidon begin to take the lead? 1473.
Under what people did Sidon reach its greatest prosperity? 1753.
What did Hiram, king of Tyre, furnish to Solomon? 1963.
What colonies were founded by the Phœnicians? 342, 1473.
What is the origin of the English alphabet? 1722.
What were the two chief manufactures of Phœnicia? 773, 1473.
What did the Phœnicians know of mining and working metals? 1473.
What is the last period of Phœnician history? 1473.
What was the religion of the Phœnicians? 1473.
When did the last shadow of Phoenician independence pass away? 1473.

GREECE.

From what people did the ancient Greeks come? 801.
What were their character and occupation? 801.
How did they enter Greece? 801.
What did each succeeding tribe do to the ones that went before them? 801.
When did the Greeks found cities in Sicily? 1751.
What was the early form of government in Syracuse? 1861.
Where is Sparta located? 1792.
How were the citizens classed? 1792.
What did Lycurgus do for Sparta? 1792.
In whose honor was Athens named? 130.
How is Draco unjustly blamed? 548.
What did Solon make the title to citizenship? 1779.
What was Solon's purpose in doing this? 1779.
What was the ceremony of giving an oracle? 518.
Where were the Pythian games held? 1568.
When were the Olympic games abolished? 1381.
What Persian king made the first two wars against Greece? 504.

What was one of the decisive battles of the world? 1167.
What Persian king made the third expedition against Greece? 2118.
Who was one of the ten generals chosen to resist the Persian invasion of Attica? 1228.
How many men escaped from the battle of Thermopylæ? 1901.
Who led the fight at the pass? 1056.
How did Themistocles win the battle of Salamis? 1664.
What rival helped him to win this battle? 97.
What other contest took place on the same day? 343.
Why was Themistocles banished? 1899.
Where was Mardonius, the Persian, defeated? 1502.
When was the most brilliant epoch of Athens? 130.
What made the age of Pericles glorious? 130.
What was the dying statement of Pericles? 1453.
What caused the Pelopponnesian War? 1453.
What people incited this war? 455.
When was the Confederacy of Delos formed? 518.
What is the earliest Greek literature we have? 1082.
What closes classical Greek literature? 1082.
What work of art illustrates a thousand years of Grecian history? 669.
What ruined the Parthenon? 1426.
Who built the Propylæa? 1465.
Where and when was Herodotus born? 868.
How did Socrates teach? 1777.
Why did he marry Xantippe the famous scold? 1777.
Why did Plato abandon poetry? 1502.
What are the important works of Aristotle? 97.
How did the drama arise in Greece? 550.
What are the seven tragedies of Æschylus? 21.
Who won the prize long held by Æschylus? 1781.
What happened in Athens when Euripides died? 632.
What heroic resistance did Platæa make to Sparta? 1501.
Who was the first king of Macedon? 1135.
Who was the father of Alexander the Great? 1135.
At what age did Alexander take charge of his father's government? 44.
What did Demosthenes do to stop the Macedonian conquest? 1899.
How did Alexander avenge himself upon the citizens of Thebes? 1899.
In what great battle did he defeat the Persians? 44.
What were the conditions of surrender made by Alexander to Darius? 44.
What disaster to Persia followed the battle of Arbela? 44.
Who did Alexander say should inherit his throne? 44.
When did the magnificent city of Persepolis disappear from history? 1455.
In what year did Greece become a Roman province? 1135.
What horde of barbarians ravaged Greece in 395 A.D.? 801.
Who defeated the Bulgarians? 801.
When did Greece pass into the hands of the Turks? 801.
When did the war of independence break out in Greece? 801.
What famous English poet fought with the Greeks in this war? 298.
Who was elected king of the Hellenes in 1863? 801.
Are the modern inhabitants of Greece descended from the ancient Greeks? 801.

ROME.

What is the legendary history of Romulus? 1631.
What peoples were mingled to form the ancient Romans? 1626.
What is the most rational view regarding the founding of Rome? 1626.
What crime led to the founding of the republic? 1872.
How have we learned the history of the Etruscans? 630.
Who made Rome the acknowledged head of Latium? 1872.

How did the Romans get Sabine wives? 1651.
What final victory placed Rome in control of all Italy? 1627.
When was Etruria admitted finally to the Roman empire? 630.
What were the Punic wars and when did each break out? 1562.
What did Rome gain by the first Punic war? 343.
How many years did Hamilcar defy Rome? 830.
What famous Carthaginian general fought during the second Punic war? 834.
What terrible punishment was visited upon Carthage at the end of the third Punic war? 1707.
What was the last battle Rome had with a civilized people? 1627.
Who was Jugurtha (1365), and what general finished the war with him? 1172.
In what city was the insurrection of slaves organized? 331.
What famous slave raised an army of 100,000 men to fight Rome? 1792.
What ended the servile war? 1525.
How did the plebeians wrest the tribuneship from the patricians? 1941.
Who let loose 4,000 slaves to kill the aristocrats of Rome? 1172.
How did Sulla get rid of his enemies? 1845.
What was the proud boast of Cornelia, the Roman matron? 789.
At what famous battle was Pompey entirely overthrown? 303.
How did Cæsar feel over Pompey's death? 1525.
From what city did he send his famous message: "I came, I saw, I conquered"? 2031.
Where does the modern title of Emperor come from? 303
What month was named in honor of Cæsar? 303.
What celebrated battle made Augustus master of the Roman world? 138.
Why did the beautiful queen Cleopatra commit suicide? 409.
What was the extent of the Roman empire at the death of Augustus? 1627.
Who was the first emperor to lead the Roman legions in person? 1934.
What emperor made a tour of the empire on foot to learn the needs of the provinces? 822.
Who was the saintliest of pagans? 139.
What new form of government did Diocletian give Rome? 533.
How did the cross come to be the standard of the Roman soldiers? 447.
Does Constantine's system of government exist anywhere today? 447.
With what power did he endow Christianity? 447.
What great general overthrew the Vandals? 2002.
What was the end of the Roman empire? 1627.

EUROPE.

What name is given to all ancient German races? 1895.
What barbaric women killed themselves and their children at the battle of Verona? 399.
Who were the Ostrogoths and the Visigoths? 784.
What misfortune befell Rome by the putting to death of Stilicho? 37.
What saved Europe from the Huns? 785.
What were the character and manner of living of the Huns? 899.
What remarkable meeting took place between Pope Leo and Attila? 899.
How were the Goths converted to Christianity? 785.
What is the value of Gothic in the study of Teutonic languages? 785.
What important part in history is played by the monks of the middle ages? 1250.
What was then the most important body of monks? 1250.
What work was done by the Benedictine monks for literature? 1063.
How did King Clovis become a Christian? 413.
What monks brought Christianity into England? 616.
What pope established our present calendar? 307.
What English priest became the Apostle of Germany? 242.

What religious order produced some of the greatest preachers and teachers of the middle ages? 543.

What was the famous contest of investiture between Hildebrand and Henry IV? 804, 326, 812.

What pope established Ash Wednesday observance? 119.

To whom is the Catholic Church indebted for her ritual and chants? 804.

Who first made the pope a temporal sovereign? 1450.

When was the temporal power of the pope formally established? 1054.

What were the ecumenical councils? 396.

Who were the Black Friars of England? 543.

Who Christianized the Saxon people? 368.

What emperor set up schools throughout his country in the ninth century? 368.

What people harassed England during the time of Alfred the Great? 48, 616.

When did the Northmen first attack England? 1359.

Who was the most illustrious of the Normans? 1360.

Who was absolute owner of all the land under the feudal system? 658.

How were the kings of Europe supported under the feudal system? 1875.

Under whose dominion was the Holy Roman Empire? 634.

Over what provinces did Henry II of Anjou reign? 634.

Where were the Hungarians located? 634.

How was half the population of Europe destroyed in 1348? 1499.

Whose reign was known as the golden age of Portugal? 610.

When did Portugal rank as one of the greatest monarchies of Europe? 1534.

At the beginning of the sixteenth century what was the extent of the empire ruled by Charles V? 634.

Who delivered Holland from the Spanish yoke? 879.

When did the Thirty Years' War occur? 634.

In what century was Sweden a great power? 634.

When did Russia begin to make a steady growth? 634.

At what time was Poland one of the most powerful states in Europe? 634.

When did the duchy of Prussia become independent of Poland? 634.

When did Russia begin to make a steady growth? 634.

When did the French Revolution occur, and how did it affect the map of Europe? 634.

After the fall of Napoleon's empire, how were the portions of Europe governed which now comprise Italy, Holland, Belgium, Germany and France? 634.

What are the chief changes in Europe since the middle of the nineteenth century? 635.

The early history of Europe is that of what three great empires? 633.

What barbaric people were next to the Western Empire? 634.

What people were next to the Eastern Empire? 634.

How were the German barbarians divided? 634.

Where was the home of the Slavs? 634.

Where were the Gothic tribes found? 634.

What people entered Britain when abandoned by the Roman garrisons? 634.

What became the starting point of the kingdoms of France and of Germany? 634.

What great empire began near the close of the eighth century? 634.

What important victory had much to do in keeping Europe from becoming a Mohammedan country? 371.

When did the Mohammedans establish themselves in Spain? 634.

In what century was the Holy Roman Empire established? 634.

Who was the first Roman to sail around England, proving it to be an island? 26.
Almost every country of Europe was brought under the power of which pope? 927.
Where is Thermopylæ Pass, and what made it famous? 1901.
What was the Augustan age? 137.
To what power does Iceland belong? 911.
For what is the Dardanelles celebrated in ancient history? 503.
What territory does the Ottoman Empire comprise? 1955.
When did Servia first lose her independence, and when last gain it? 1726.
What queen conquered Sweden, Lapland and Finland, and was afterwards called the Semiramis of the North? 1170.
What victory of the eighteenth century prevented the invasion of England by the French? 1663.
Who were the Turanians? 1952.
What Albanian chief with fifteen thousand men defied the Sultan, who had an army of one hundred and fifty thousand? 1687.
What caused Napoleon's defeat at Waterloo? 1301.
What empire was much reduced in territory by the Treaty of Berlin? 205.
What battle prevented the inferior nations of the East from destroying the civilization of the West? 135.
When and where was the last battle fought by the Goths? 785.
How long did the age of chivalry last? 1008.
What was the condition of knighthood under the feudal system? 1007.
What was the badge and what was the war-cry of the Crusaders? 483.
What became of the children of the Children's Crusade? 483.
Where is the oldest cathedral in Normandy? 184.
What church did St. Augustine consecrate in England? 326.
What is one of the finest specimens of Gothic architecture in Europe? 425.
What church was built to enshrine the bones of St. Cuthbert? 563.
What cathedral offers examples of all styles of Gothic architecture? 610.
Where is the Augustinian monastery which once was the home of Martin Luther? 623.
What dome served as a model for St. Peter's? 683.
Where is the famous bell Great Peter? 774.
What cathedral, begun in 1386, was finished by order of Napoleon? 1223.
Where is one of the great towers of Italy? 1245.
Where are the two cathedrals of Notre Dame in France? 1422, 149.
How high is the belfry tower of St. Bavon's cathedral in Ghent? 763.
What cathedral has a cedar crucifix dating from A. D. 782? 1122.
How far back do the annals of Westminster Abbey go? 1111.
What is one of the finest Byzantine churches from the period of Constantine? 93, 447.
What is the highest church-spire in England? 1665.
Where is a son of Columbus buried? 1729.
What is one of the finest Gothic churches in Italy? 1753.

FRANCE.

Do the French emigrate largely? 706.
Who was the earliest historian of France? 704.
What was it called by that writer? 704.
What was its condition when invaded by Cæsar? 704.
What people succeeded the Romans in power? 704.
What dynasty did Clovis found? 704
Who founded the Carlovingian dynasty? 704.
Who was the real founder of the French monarchy? 704.
What caused the enmity between France and England? 704.
What was the Seventy Years' Captivity? 1467.

What was the Salic Law? 704.

What great battle was fought at Crécy? 476. At Poitiers? 1512. At Agincourt? 26.

During what period did the Valois monarchs occupy the throne? 2000.

What king was called the father of his people? 704.

Under what king did the house of Guise become powerful? 704.

What effect did the massacre of St. Bartholomew have upon the country? 704.

Who was the first of the Bourbon princes? 704.

What king first lived in the palace of the Tuileries? 1949.

Who caused the overthrow of the Huguenot party as a political power? 1612.

In whose reign did France reach its highest point of luxury and power? 704.

What did Colbert do for France? 420.

Who were the two greatest generals during the civil wars? 1953.

What wars were closed by the Treaty of Ryswick? 1650.

What effect had the revocation of the Edict of Nantes? 704.

Who abolished the compulsory labor of the poor on the public roads? 1954.

When did the French Revolution break out? 704.

What occasioned it? 717.

What was the character of Louis XVI.? 717.

When was the Bastille taken? 717.

Who were the Girondists? 717.

Who were the Montagnards? 717.

What was the Jacobin Club? 955.

Who led in the Reign of Terror? 717.

What was the Commune of Paris? 434.

What was the Directory? 533.

When did Napoleon become consul of France? 278.

What victory did Napoleon win at Marengo? 1169.

When and by what means was Napoleon declared emperor? 705.

How did Napoleon change the map of Europe? 705.

When and where did Napoleon sign his act of abdication? 689.

What general indirectly caused Napoleon's defeat at Waterloo? 807.

Who was the last of the French kings? 705.

Who was the first president of the new republic? 705.

How did Napoleon III become emperor? 705.

Who attempted to assassinate Napoleon III? 1395.

Who was the first president of the republic after the Franco-German war? 705.

Who succeeded Thiers as president? 1140.

GERMAN EMPIRE.

What skillful leader did much to increase the power and influence of the empire? 759.

By what emperor was Prince Bismarck deposed from the position of chancellor? 759.

When was the first university founded in Germany? 760.

How are the universities controlled? 760.

What is Walpurgis Night, and what caused its origin in Germany? 2038.

When do the Germans first appear in history? 758.

What was their condition at the time of meeting the Roman armies? 758.

What was the origin of the Goths, Franks and Saxons? 758.

After the breaking up of the Roman Empire what kingdoms were formed by the Franks? 758.

What noted person was the first of a succession of rulers that lasted over a thousand years? 758.

How many nations were there in Germany at the time of Charlemagne's death? 758.

How did Henry III strengthen the empire? 758.
When did the famous Frederick I reign? 758.
How did the great monarch Frederick I. spend most of his time? 758.
During the reign of Maximilian I what great reformer began preaching? 758.
How did the Peasants' War and the Thirty Years' War affect the rural parts of Germany? 758.
In 1702-13 what war brought glory to the German arms but was of no advantage to the country? 759.
When did Frederick the Great come into prominence? 759.
What was the condition of Germany during the time of Napoleon's power in Europe? 759.
What combination did the free German states make after the fall of Napoleon? 759.
What war occurred in 1866 for the leadership in Germany? 759.
What part did the southern German states take in the war between France and Prussia? 759.
What was the most important result of this war? 759.

HOLLAND.

When did the Frisians occupy what is now Holland? 879.
In the eighth century they submitted to what ruler? 879.
What Spanish ruler made the Netherlands a country of great importance? 879.
Who delivered the Dutch from the Spanish yoke? 879.
In what century was Holland one of the great powers of Europe? 879.
By what country was her power crippled in the naval war of 1652-54? 879.
What did William III of England do for Holland? 879.
What century marks Holland's decay? 879.
Who was made king of Holland in 1806? 879.
When was Holland added to the French empire? 879.
After the fall of Napoleon what kingdom was formed? 879.
When did Belgium secede? 879.

ITALY.

Who was crowned king of Italy and emperor of Rome in 961 A. D.? 947.
For how many years did the crown of Italy belong to the kingship of Germany? 947.
What was the condition of the Italian kingdom while its foreign emperors were living beyond the Alps? 947.
To what did Emperor Frederick Barbarossa agree in 1177? 947.
How was Italy divided in the fourteenth and fifteenth centuries? 948.
What century was the most disastrous in Italian history? 948.
In the sixteenth century how was the papacy strengthened? 948.
When did Napoleon conquer Italy? 948.
What did the Congress of Vienna do for Italy in 1815? 948.
Who were the leaders in the rebellion of 1848? 948.
When did the emancipation of Italy become complete? 948.
What did the pope retain? 948.
When was King Humbert assassinated? 948.
Who is the present ruler of Italy? 948.

SWITZERLAND.

What is said of the first inhabitants of Switzerland? 1858.
When was Christianity adopted? 1858.
Of what empire was Switzerland formerly a part? 1858.
What caused the men of the forest cantons to begin war against Austria? 1858.
What famous battle ended the Swiss struggles with Austria? 1858.
By what means was other territory won by Switzerland? 1858.
How did Zurich become a Protestant city? 1858.

Against whom was a religious war waged? 1858.
Who was successful in this war? 1858.
In what treaty did the European powers acknowledge the independence of Switzerland? 1858.
By whom was Switzerland seized in 1798? 1858.
When did it recover its freedom? 1858.
What have the various cantons attempted to regain since they recovered their freedom from France? 1858.
Who were the Free Corps? 1413. What was their purpose? 1413.
What league did the Catholic cantons form? 1858.
By whom was a successful war waged against the Catholic cantons? 1858.
When was the present constitution chosen? 1858.

SPAIN.

Of what race do the Spanish nobles claim to be descendants? 785.
What has made Seville one of the country's most famous cities? 1729.
During what siege did women and children throw themselves into the fire while the men fought? 1654.
What is the condition of the Alhambra to-day? 50.
Who were the earliest visitors to Spain? 1788.
What people made the first effort to occupy the country? 1788.
What people were expelled by the Romans? 1788.
When was the Roman conquest of the peninsula completed? 1788.
By what name was Spain known to the Romans? 1788.
When did Spain become the seat of a Gothic kingdom? 1788.
How long did the Moorish kingdom in Spain last? 1788.
When did it reach its highest prosperity? 1788.
Who was the most powerful ruler? 1789.
How were the different provinces united? 1789.
What discovery raised Spain to a high place among European nations? 1789.
How did Philip II become king of the country? 1467.
How did he exhaust the strength of the country? 1789.
For what purpose did he organize "the invincible Armada"? 1467.
Under whose leadership was the Union of Utrecht formed? 1467.
What part did Spain take in the Thirty Years' War, and with what result? 1789.
Who was the first Bourbon king of Spain? 1789.
What queen whom Carlyle called the termagant disturbed the peace of Europe for thirty years? 1469.
What king did the people of the country refuse to recognize in 1808? 1789.
What great naval battle was fought at Trafalgar? 1934.
Who is the present king of Spain? 1789.
What led to the Spanish-American war, and what was the result of this war? 1789.

SCANDINAVIA.

How far back does the history of Denmark go? 520
What country did Waldemar I conquer? 521.
What was the character of Queen Margaret's rule? 521.
How was Christian I chosen king? 521.
Under whose rule was Sweden separated from Denmark? 521.
When was Norway lost to Denmark? 521. To Sweden? 1855.
With what other people is the history of this country associated? 1361.
When was Norway attached to Sweden? 1361.
When were titles of nobility abolished? 1361.
Who is said to have first conquered the whole of Sweden? 1854.
What were the Swedes in general doing at the time their history begins? 1854.
Who was the first Christian king, and when was he baptized? 1854.
When and under what ruler were the three Scandinavian countries united? 1854.

How did the great general, Gustavus Adolphus, spend the greater part of his reign? 1854.

What acknowledgement did Charles XI win from the diet? 1855.

How did Charles XII make his power felt in Europe, and what was the effect in his own country? 1855.

What acknowledgment did Charles XI win from the diet? 1855.

Who was Charles XIV? 1855.

What is the most celebrated cathedral in Sweden? 1991.

What is known as the blood-bath of Stockholm? 1828.

RUSSIA.

From what direction did the Russian Slavs enter Russia? 1647.

When was the first written law compiled? 1647.

What kind of government was established in the towns and colonies founded as the Slavs steadily moved eastward? 1647.

What did Prince Andrei Bogalubski do? 1647.

What people conquered the Russians in 1224? 1647.

What effect did the Mongol conquest have upon the civilization of the country? 1647.

When did Russia first try to throw off the Mongol yoke? 1647-8.

What Russian prince succeeded in defeating the Mongols and freeing Russia? 1648.

Who was the first to take the title of tsar? 1648.

What order of Regent Boris Godunoff sowed the seed of serfdom? 1648.

Under Alexis, the Russians gained the upper hand of what rival power? 1648.

What improvements did Peter the Great make? 1648.

What officers were the real rulers under Catherine I and Peter II? 1648.

Under whose reign occurred the first partition of Poland and the widening of Russia's domain? 1648.

Under whose reign was Russia invaded by the French and the city of Moscow burned? 1648.

What did Alexander II do for the serfs? 1648.

Have the mines of Siberia been developed? 1750.

What name was given to the earliest inhabitants? 1750.

What people conquered the country in the eleventh century? 1750.

What class of Russians were the first to invade Siberia? 1750.

When was Russian possession of Siberia acknowledged by China? 1750.

When does the history of Poland begin? 1513.

From the reign of Mieczyslaw, how long did Poland continue as an independent power? 1513.

When did the first partition of Poland take place? 1513.

What countries combined for the dismemberment of Poland? 1513.

Where was Kosciusko defeated and made a prisoner? 1513.

What were the conditions that led to the downfall of Poland? 1513.

What action was taken against the Jews by Alexander III? 1648.

Of recent years does Russia seem to be progressing? 1648.

TURKEY.

Of what empire is the Ottoman Empire the successor? 483.

Who was its founder? 483.

What sultan conquered Constantinople and when? 1956.

What sultan raised Turkey to its highest military power? 1956.

Who was called the Magnificent? 1956.

What was the result of the battle of Lepanto? 1056.

What generals reduced the Turkish power in Europe? 1956.

What general conquered Egypt? 1956.

Who were the janizaries? 960.

How did Mahmud II rid his empire of them? 960.

What troops have taken their place? 960.

What was the result of the battle of Navarino? 1956.
In what year did Greece become independent? 1956.
When was Turkey admitted into the political system of European states? 1956.
What caused the Russo-Turkish war? 1956, 1957.
How did this war change the map of European Turkey? 1957.
What was the cause of the Armenian massacres? 1957.
When did they occur? 1957.
What was the extent of their design and how far was this accomplished? 1957.
What is the largest city? 1957.
What city contained three thousand statues, including the wonderful Helios? 1607.

JAPAN.

Who is the Japanese Bismarck? 960.
How many small islands in Japan? 961.
What is the population of Japan? 961.
What kinds of wood are grown in Japan? 961.
What makes the coast look like a Japanese screen? 961.
What is the character of a large percentage of the country? 961.
Do Japanese babies cry? 961.
How do the Japanese dress? 961.
What are the houses built of? 961.
What gives Japan a holiday air? 961.
What happens at cherry-blossom time in April? 962.
What are the two religions of Japan? 962.
When did St. Francis Xavier introduce Christianity. 962.
When did true historic records begin to be kept? 962.
What made Japan a hermit empire? 962.
When did the Dutch and Portuguese trade with Nagasaki? 962.
What did Commodore Perry demand in 1854? 962.
What singular distinction belongs to Mutsuhito? 1292.
Who told the powers they had been hoaxed? 962, 1293.
What dramatic changes mark the seven decades of Mutsuhito's life? 1293.
What is the Era of Enlightened Peace? 963.
What did the daring young nobles do in the 50's? 963.
How did the boy-emperor instruct the Japanese representatives? 963
What are the five orders of the new nobility? 963.
After what model was the army organized? 963.
What countries were imitated in the navy? 963.
What countries furnished the pattern for the constitution? 963.
When was Port Arthur fired on? 964.
Where was the first great modern naval battle? 964.
Who helped to end the Russo-Japan war? 964.
How big is Tokyo? 964.
What trouble arose in San Francisco in 1906? 964.
What arts are declining in Japan? 965.

CHINESE EMPIRE.

How many years back do the annals of China extend? 390.
China as an empire dates from what year? 390.
In what year did the present dynasty begin to reign? 390.
What two personages are always found in China, no matter how far back you go? 390.
Whose death in 1405 saved the independence of China? 1914.
From what has the custom grown, since the seventh century, that all officers of the government must be educated? 390.
What are the three religions of China? 390-1.
What is the charcteristic of each religion? 390.
Of what does the government power of the empire consist? 391.
At what hour of the day does the Grand Cabinet meet? 391.

In what year did European nations begin to trade with China? 391.
What caused the war with England in 1840? 391.
When and by whom was the first treaty made between China and the United States? 391.
When did the present emperor come to the throne? 391.
What was the cause of the war with Japan in 1894? 391.
What was the result of the war with Japan in regard to Chinese territory? 391.
When did the Boxer rising occur? 254.
Who was the instigator of the Boxer rising? 254.
How long were the foreign legations besieged in Pekin? 264.
The representatives of what foreign nations were murdered? 264.
How many persons were killed in defending the legations? 264.
What indemnity was demanded of China by the foreign nations? 264.

GREAT BRITAIN AND IRELAND.

Did the cave-men own domestic animals? 353.
Where did the Celts first make their home? 520.
Why are the Celts said to be one of the oldest distinct races in the world? 116.
What was the nature of these primitive people? 116.
What are the purely Celtic people? 357.
Did these ancient people believe in God and a future life? 554.
What were their bards, prophets and priests called? 554.
What was the most numerous and powerful of the British tribes? 2123.
What is one of the most ancient of British cities? 2123.
Who was the first Roman to invade Britain? 303.
Did the Romans conquer Wales? 2034.
What Roman general spent seven years conquering the island? 26.
What "warrior queen" slew 70,000 Roman soldiers for injuring her people? 232.
What Roman emperor died in England? 2123.
What three tribes conquered Britain after the Romans left? 73.
Why was Britain called England? 73.
What is the meaning of Heptarchy? 73.
Is the English language like the Anglo-Saxon tongue? 1088, 73.
What terrible foes were driven from Wessex by Alfred the Great? 48.
How did he spend the years of peace that followed? 48.
How did the Danish king Canute get possession of England? 583.
What was the noble character of Canute? 328.
What religious difference was there between Canute and his grandfather? 521.
From what countries came the Celts, Angles, Saxons, Jutes, Danes and Normans? 520, 1687.
What marriage led to the introduction of Christianity? 616.
What monk made King Edgar's reign the most prosperous in early history? 562.
What great Englishman helped Edward the Confessor to restore the Saxon line? 776.
When was the battle of Hastings fought? 2085.
What has the battlefield been called ever since? 847.
When was feudalism brought into England? 616.
Why did William the Conqueror invade England? 2085.
How did he avenge a sarcastic remark about his fatness? 2086.
How did William meet his death? 2086.
What price did William Rufus pay for Normandy? 2086.
Which of the Conqueror's sons was known as the Lion of Justice? 862.
Which one was a crusader? 483.
What was the condition of a serf? 1765.
What form of serfdom remained in Scotland until about 1800? 1766.
What ancient people played the bagpipe? 157.
Who was the wife of Geoffrey Plantagenet? 862.

Name the Plantagenet kings? 1501.
What angry remark led to the death of Thomas à Becket? 189.
What were the Constitutions of Clarendon? 189.
How did Richard the Lion-Heart spend the greater part of his reign? 1610.
How was King John Lackland disgraced? 616.
How were the Englishmen benefited by the Magna Charta? 1145.
Whom do the English people call St. Simon? 1257.
What king is known as the English Justinian? 586.
When were all Jews driven from England? 586.
Upon what great principle of justice was the House of Parliament founded? 616.
What did Edward I do for John Balliol, the Scotch king? 586.
What king was cast into prison by his wife? 586.
Who led the Scots in the historic battle of Bannockburn? 586.
What relic of this battle is shown today in Scotland? 170.
What king was for many years an outlaw in his own kingdom? 278.
What war helped to free the lowest orders from serfdom (616) and permanently changed the relations of master and laborer? 587.
Did the famous Black Prince ever become king of England? 587.
When were cannon first used by the English? 476.
Why did Edward II send his uncle on a wild expedition into Spain? 974.
What happened to Richard II upon his return from an expedition to Ireland? 1611.
What put an end to the Wars of the Roses? 249, 587.
What great queen spent 20 years in war and 4 in prison? 1170.
How did Edward IV get the money he needed? 587.
How did Richard III suffer for his numerous crimes? 1611.
What brewer became the father of a line of English kings? 1949.
How did the first Tudor king reunite the red and white Roses? 863.
What admirable qualities had Henry VIII during the first half of his reign? 863.
Who was Catherine of Aragon? 350.
What honorable title was bestowed on Henry VIII by Pope Leo X? 863.
What suggestion did Cranmer make to ease the mind of Henry VIII? 474.
What ruined the reign of Mary Tudor? 1180.
Who is called the Morning-Star of the Reformation? 2114.
When did England become a world power? 607.
What was the dismal end of the Spanish Armada? 103.
What are the great blots on the reign of Queen Elizabeth? 607.
What right had Mary Queen of Scots to the throne of Elizabeth? 1181.
What great poet made the reign of Elizabeth illustrious for all time? 1089.
When did Parliament allow English to be spoken in the law-courts? 618.
Who was called the wisest fool in Christendom? 957.
What caused the struggle between Parliament and Charles I? 368.
What did the nicknames Roundhead and Cavalier mean? 353.
Did Cromwell's government benefit the people of England? 481.
How did Cromwell treat the Irish? 937.
When was Cromwell made Protector? 171.
Why is William III called the first parliamentary king? 617.
When did the present reigning dynasty of England come to the throne? 617.
When was the society of Orangemen formed? 1388.
When were the king and queen of England both crowned sovereigns? 2086.
What celebrated queen was the mother of 17 children? 75.
Who are the peers of England? 1424.
When was Sir Robert Walpole actual ruler of England? 2038, 751.
Describe the South-Sea Bubble. 1787.

Who is the prime minister of England? 300.
What eminent statesman was prime minister to George III? 751.
What caused him to lose the American colonies? 751.
When did the British East India Company settle in India? 920.
What victory fastened England's rule upon Bengal? 411.
When were the exclusive privileges taken away from the East India Company? 576.
What famous trial of seven years was held over East Indian affairs? 847.
How did the Seven Years' War affect the American colonies? 1727.
What famous general was known as the Iron Duke? 2067.
When was the 3rd of Sept. changed to the 14th, to the consternation of ignorant people? 307.
What was the Manchester Anti-Cornlaw League? 416.
Why was Victoria the most constitutional monarch of England? 2019.
What did the great reform-bill do for the English people? 617.
What brought an end to the Crimean War? 478, 1716.
When did the Indian Mutiny occur? 354.
What famous general was born at Cawnpore? 1619.
How did Queen Victoria become endeared to the American people? 2019.
What war cost England $937,000,000 in four years? 235.
What immense service did "Little Bobs" render his country? 1619.

AMERICA.

Who recommended Columbus to Queen Isabella? 431.
Which of the West Indies is said to have been first discovered? 157, 2070.
How is the Duke of Veragua related to Columbus? 431.
Was Columbus the first to believe that the earth is a sphere? 745.
What famous maker of maps first showed that America is a new continent? 301.
What did the Filipinos do to Magellan on the first voyage around the globe? 1144.
What letter to a school-friend caused America to be named? 2016.
Did the man who discovered the Pacific name it? 1407.
Where did the American Indians come from? 60, 921.

MEXICO.

When did the Toltecs come to Mexico? 1216.
Who invented the Mexican calendar? 1216.
Who was Aztlan? 150.
What broke the heart of the last Aztec emperor? 1257.
How were the Aztec women educated? 150.
Where are some Aztecs living today? 1668.
Where did Cortes burn his ships? 462.
Was Cortes a common adventurer? 462.
What is one of the romances of history? 1216.
How are the records of the Aztecs preserved? 150.
How did the Spaniards treat the native Mexicans? 1216.
What did New Spain include? 1216.
How did the priest Hidalgo serve his countrymen? 1216.
Who established the Mexican republic? 1216.
Under what incompetent monarch did Spain lose Mexico? 656.
What is the character of Emperor Augustine I? 949.
What relation had the Mexican states to the central government? 1675.
Under what president was war again declared? 1216.
Where did Maximilian make his last stand? 1574.
How did he directly cause his own death? 1192.
What was the pathetic fate of his loyal queen? 1192.
What faithful general was executed with him? 1239.
Who is the ablest of Mexican rulers? 1216.

Of what nationality is the higher class? 1216.
What man's life offers no parallel in history? 528.
At what age did Diaz walk 250 miles to enlist? 528.
Why is Diaz called the perpetual president? 528.
What is the salary of Diaz? 529.
Where is his home? 367.
What great emperor is compared with Diaz? 529.
What were the parents of President Juarez? 981.
When did he take over the government? 981.
When was his government recognized by the United States? 981.
When did Santa Anna become president? 1675.
In what army did he serve against his country? 1675.
How did he cause the loss of Texas? 1675.
What battle did he lose to Gen. Sam Houston? 1673.
When was he told to leave the country? 1675.
What is one of the most prosperous manufacturing towns in Mexico? 1256.
What did Las Casas do for the native Indians? 344.
What people founded the City of Mexico? 1213.
What lineal descendant of the ancient emperors wrote a complete history of Mexico? 951.
What is the holiest shrine in Mexico? 1214.

CANADA.

Who visited Newfoundland five years after Columbus discovered America? 1341.
How did the West-of-England fishermen conceal their profitable voyages? 1341.
What character had the Newfoundland colonists? 1341.
What brilliant English victory of the Seven Years' War was gained here? 1341.
When was the first civil governor appointed? 1341.
What remarkable resemblance does Newfoundland bear to the British Isles? 1342.
How did the first railroad benefit Newfoundland? 1341.
From what part of England did the early settlers come? 268.
Is Newfoundland a part of the Dominion of Canada? 269, 320.
Who discovered the mainland of Canada? 343.
What name did the French give to Nova Scotia? 6.
What part of the population is Acadian? 6.
What splendid schools and colleges flourish in Nova Scotia? 1363.
What great king reigned in England when Nova Scotia was discovered? 319, 863.
Why did the Indians call Halifax Chebucto? 827.
In what famous treaty was Nova Scotia acknowledged to be British territory? 319.
Tell some interesting facts about that famous Englishman who founded the Hudson Bay Company. 1644.
What was the extent of its territory? 893.
Who was the last resident governor of the Hudson Bay Company? 1836.
What was the first white settlement in Manitoba? 1159.
From what country did these settlers come? 1159.
When did Manitoba become part of the Canadian federation? 1159.
Near what fort did the village of Winnepeg grow up? 2095.
What has made Alberta famous? 307.
What caused the Red River Rebellion? 1596.
What was the fate of the leader? 1613.
What archbishop induced the rebels to lay down their arms? 1596.
Who commanded the Red River expedition? 2103.
What foolish act of a mob gave Willian Lyon MacKenzie increased influence? 1138.

Who was the only Canadian refugee to whom an amnesty was refused for rebellion? 563, 1138.
What caused the rebellion of 1837? 1385.
What Canadian premier took part in this rebellion? 343.
What has caused the mistaken impression of Canadian climate held by Europeans? 1966.
What name did Cartier give to the Indian village of Hochelaga? 343.
What is the commercial metropolis of all British America? 1285.
Where did the French missionaries and traders start from on their daring expeditions? 1572.
What are some points of interest in the most historic city of Canada? 1573.
How did France lose Canada? 1117.
What great war led to the Treaty of Paris? 1728.
What struggle increased the British possessions in America twenty-fold? 716.
How did George Washington help England to gain Canada? 714.
What great Canadian missionary was sent by Frontenac to explore the Mississippi? 1175.
How did Joliet lose all his maps and papers on this voyage? 977.
What large island is owned by Menier, the French chocolate-manufacturer 80.
What caused the assassination of that romantic hero, La Salle? 1033.
What Franciscan explorer sailed with La Salle? 861.
Who was Henri de Tonti? 1923.
What was the dying tribute Montcalm paid to his noble English conqueror? 2103, 1255.
What memorable battle wrested supremacy from the French? 4.
Who was the first Roman Catholic bishop of Quebec? 1037.
What is a proof the the broadmindedness of the British government? 1037.
Who is Quebec's most honored citizen? 1036.
What distinguished citizen of Quebec endowed a magnificent agricultural school? 1573.
What great university was founded in 1811? 1136.
What Canadian educator stands in the first rank of American thinkers? 1189, 1037.
What great French pioneer was loved by the wild people of the forest, by courtiers and close-fisted merchants? 366.
What island is a paradise for summer tourists? 1547.
How could the Indians get to any part of New Brunswick? 1324.
What splendid park is a paradise for campers? 50.
When did the actual career of Ontario begin? 1384.
When did the Fenians invade Canada? 655.
What splendid agricultural college in Ontario? 810, 1228.
What governments closely approach civic perfection? 1385.
What large city is supplied with electric power from Niagara Falls? 1924.
What department-store employs 4,000 hands? 1924.
Where is the residence of the governor-general of Canada? 1400.
What improvements have been made in the St. Lawrence channel since 1857? 1659.
What building is architecturally one of the most imposing on the continent? 1924.
What part of Toronto University was founded by the Basilian Fathers? 1661.
What college sent out the first missionaries for the Church of England in Canada? 2115.
What noble count changed the course of New World history? 720.
On what historic ground did he camp 234 years ago? 1005.
How is Niagara illuminated? 1345.
What was Anthony Trollope's tribute to Niagara Falls? 1346.

What naturalist discovered the lowest form of animal life? 509.
What dispute was jokingly called the Aroostook war? 111.
Who discovered the Klondyke goldmines? 1007.
What celebrated dispute did this reopen between Canada and the United States? 38.
What is Sir Wilfrid Laurier's patriotic hope for the future of Canada? 1036.
What Irish representative to the British Parliament was once leader of the Liberals in Canada? 225.
Upon what Indian reserves was built the first church (Episcopalian) in Upper Canada? 260.
What Indian chief translated *The Gospel of Mark* and *The English Prayerbook* into Mohawk? 260.
Where was the first large suspension-bridge built? 266.
For how long is copyright granted in Canada? 453.
How many times have Fenians invaded Canada? 655.
What Canadian statesman was governor of the Windward Islands and later of British Guiana? 875.
What indemnity did the Hudson Bay Company receive for its rights? 893.
Where is left a remnant of the Huron Indians? 900.
What Canadian statesman was offered a knighthood three times but declined? 1137.
When was use first made of power at Niagara? 1346.
When was work first begun at Niagara to develop electric power? 1346.
What Anglo-Canadian novelist is a member of the British Parliament? 1423.
What Indian chief was a brigadier-general in the War of 1812? 1879.
What Indian put off his uniform and sword and dressed like an Indian because he believed he would be killed in battle? 1880.
By whom was Vancouver founded? 2001.
How do the Huron Indians tell the story of their origin? 900.
Where was the first modern cantilever bridge built? 267.

UNITED STATES.

How should United States history be studied? 1977.
How did Queen Elizabeth playfully name Sir Walter Raleigh's instability of character? 1584.
When did Raleigh say: "This is a sharp medicine, but it is a sure cure for all diseases"? 1584.
How did Raleigh honor his queen? 2024.
The land of what great city was bought for beads, brass ornaments and bright cloth? 1336.
What celebrated Virginian named New England? 1149.
Where is Plymouth Rock preserved upon which the Pilgrim Fathers landed? 1507.
What is the first written constitution we have any historical account of? 1490.
What caused the first battle between Englishmen in America? 1182.
When was the Mississippi River the western boundary of Virginia? 2024.
Why is Connecticut called the Constitution State? 444.
Who was exiled for saying the government should not control religion? 2088.
Who was the first Chief Tammany? 517.
To what rebellion can the Revolution be traced? 154.
What six great colleges were founded before 1700? 1977.
What dispute was settled by the celebrated Mason-and-Dixon line? 1184, 1448.
What fortress, taken and destroyed by the New Englanders, cost $5,000,000, and was 30 years in building? 1118, 1977.

When did the Continental Congress make this noble declaration: "Religion, morality and knowledge being necessary to good government and the happiness of mankind, schools and the means of education shall be forever encouraged"? 1375.
Where was Washington initiated into the business of war? 1496.
Why did he think Providence had preserved him for some great duty? 2048.
What explorations were carried on by Jesuit missionaries? 714.
What important mission was entrusted to Washington when he was only 21? 714.
What war prepared the colonists for the War of Independence? 1977.
At what meeting in 1754 did Benjamin Franklin suggest the idea of uniting the colonies? 39.
What noted Indian fighter had the first white child in Kentucky, and performed the first marriage ceremony? 245.
What governor forced women to wear veils at all public assemblies? 614.
Who were the first Puritans? 1564.
Tell some of the adventures of Captain John Smith? 1770.
What was one of the direct causes of the American Revolution? 1978.
Upon what great principle of justice was Parliament itself founded? 616.
What eminent English statesman made one of his greatest speeches in favor of the colonists? 1808, 1496.
Where was the first regular newspaper published? 248, 1343.
What was the original name of *The Saturday Evening Post*, founded by Franklin at 23? 708.
Where did the first colonial Congress meet? 442.
What was the Continental Congress? 443, 1978.
When did the first Congress of the United States meet? 443.
Whose portrait was on the first United States postage-stamp? 1809.
What postage-stamp is worth $375? 1809.
Who was the first successful postmaster-general? 1536.
When was letter-postage reduced to two cents an ounce? 1536.
When did one cent and two cent postal cards come into use? 1537.
How many million pieces of mail go to the Dead Letter Office per year? 510.
What prophetic words were inscribed on Liberty Bell 23 years before the signing of the Declaration of Independence? 513.
At what battle did the political existence of the United States begin? 1978.
What celebrated strategy proved the turning point of the war? 1978.
How did the famous Ordinance of 1787 help to bring about the Federal Union? 1979.
When was the city of Washington made the capital of the nation? 2087, 1980.
What president first occupied the White House? 2047.
What fourteen masters did George Washington have to serve? 2049.
What high place did Frederick the Great give to General Washington? 2049.
Who uttered this celebrated tribute to Washington: "First in war, first in peace and first in the hearts of his countrymen"? 2049.
What president more than doubled the area of the United States? 1980.
What president was called the sage of Monticello? 968.
What brave little woman guided the celebrated Lewis and Clark Expedition? 1061.
How did Jefferson almost cripple New England? 611.
When did the idea of states' rights first become prominent? 1814.
Why was the Hartford Convention accused of treasonable designs? 846.
What famous Indian was an English brigadier-general? 1879, 1876.
In what administration did the president belong to one party and the vice-president to another? 1520.

What two brilliant orators have been defeated three times for the presidency? 280, 407.
What are the words of the Monroe doctrine? 1253.
Who were the National Republicans? 2075.
When did the Democrats and Republicans form one political party? 623.
What sarcastic name was given to the Compromise Bill of 1850? 1382, 438.
What was the Missouri compromise? 1242, 407.
What was intended by the Wilmot proviso? 546.
What did "squatter sovereignty" mean? 1981, 546.
Who was the author of the Nullification Act that Jackson called treason? 308, 1785, 852.
How did Texas avenge the death of David Crockett and his heroic comrades, 479, 36, 1673.
What was the first great blow delivered to states' rights? 2063, 836.
What laws protected the kidnapers of free negroes and forced these again into slavery? 722.
What was the Gadsden purchase? 728, 100.
What territory was discovered by an Italian friar and an African slave? 100.
What Indians live in immense apartment-houses five stories high? 1559.
Are the cliff-dwellers the same as cave-men? 100, 353.
What is the Urim and Thummim of the Mormons? 1263, 1992.
What conflict did the Mormons have with the Federal government? 1995.
Who invented the Macintosh coat? 1640.
Name six remarkable inventions that appeared between 1830 and 1850? 1981.
Who were the Underground Railroad "conductors" for fugitive slaves? 1966.
What was the memorable Dred-Scott case? 1869.
What chief justice decided that slaves were not "persons" but "property"? 1982.
What state declared that it might annul the laws of Congress? 1785.
What colony first raised a military force to oppose English government? 1785.
What state was the leading exponent of states' rights? 1785.
What state was the first to secede before the Civil War? 441.
How has the state been saved from the ignorant negro voters? 1785.
How were the Confederate troops outnumbered in the Civil War? 1982.
How many men were killed in the draft-riots in New York city? 548.
What general was dismissed from the army after the Battle of Bull Run? 1531, 288.
What great battle decided the Civil War? 762.
After what desperate battle did Grant write his famous message: "I will fight it out on this line if it takes all summer"? 1804.
What six books did Lincoln own when he was 21? 1073.
How did some fence rails he split help to win him the presidency? 1073.
Did the Federal government intend to assail the Confederate states when they seceded? 1074.
What Confederate was one of the greatest soldiers America has produced? 1046.
Did Robert E. Lee know the Union must triumph? 1047.
How did Grant save Lee from being tried for treason? 794.
What is the Fifteenth Amendment? 1595.
Who were those low-principled northerners known as carpet-baggers? 340.
What was the dreaded Ku-Klux Klan? 1013.
Why did the government issue greenbacks? 1792.
Who introduced Mardi Gras in this country? 1169.

When and where was the first railroad built in the United States? 1581.
How many miles of railroad in the United States in 1908? 1582.
How many miles of railroad in the world in 1908? 1582.
What is the strength of the United States army and navy? 1984.
What is the population of the United States of each: Indian, Negro and foreign born? 1976.
What is the salary of each cabinet officer? 1984.
When was the Naval Department of the United States formed and by what officers was it controlled? 1985.
How did the naturalization laws of the United States compare with those of other countries? 1307.
How is the Signal Service of the United States operated? 1755.
In what way are taxes imposed in the United States? 1874.
How many judges are there in the Supreme Court of the United States? 467.
What is the duty of consuls? 448.
What is the present policy of the United States government with regard to the Indians? 921.
To whom is the United States indebted for the purchase of Alaska? 1730.
What is the most populous city of southern California which was founded by the Spaniards? 1116.
What came near involving the United States with Chile in 1891? 388.
How is the number of representatives in Congress regulated, and how often is their number changed? 442.
Who commanded the famous *Alabama?* 1722.
When did the first Colonial Congress meet? 442.
What celebrated Polish general took part in the American Revolutionary War? 1011.
What was the beginning of the postoffice? 1536.
Which was the last settled of the thirteen states? 752.
Where are the mints of the United States? 1237.
What famous battle was fought at Gaines' Mills? 728.
What are the most noted cases of impeachment? 917.
In what war was the *Monitor* first used? 1251.
What persons are barred from serving as electors? 596.
What tribe of Indians took sides with the British during the Revolutionary War? 376.
Why was the first political party called Federalists? 1519.
What naval battle is known as Perry's victory? 1454.
Which presidents have been elected by the House of Representatives? 1545.
Whom do the Americans address as His Excellency? 12.
In what famous battle did the British lose twenty-six hundred and the Americans but six men killed and thirteen wounded? 952.
What general in the Civil War was called Superb? 833.
What harbor was headquarters for the northern division of the American fleet during the War of 1812? 1651.
What is the Signal Service? 1755.
What was the beginning of the second Seminole war? 1396.
When was the town of Chicago organized? 379.
When did the Democratic party come into existence? 1520.
What year were there four candidates in the field, all claiming to be Democrats? 1520.
Who led the Whig party and what ground did it take? 1520.
What first weakened the Whig party? 1520.
When did the Whig party cease to exist? 1520.
When did the Anti-Masonic party arise? 1520.
Of what was the Republican party formed, and when? 1520.
When were each of the three following parties formed: Greenbackers, Constitutional Union and Union Labor party? 1520.

Where did the first and the last battle of the Revolution take place? 1520.

What were the principal features of President Polk's administration? 1518.

Who commanded the "Green Mountain Boys," and in what battle? 52.

When and by whom was the District of Columbia ceded to the United States? 535.

What is the oldest permanently settled city of Iowa? 556.

What was the first instance of negro slavery we have in the United States? 2024.

When was the beginning of the modern navy of the United States? 1313.

What caused the Seminole War in the United States? 1722.

What was the Stamp Act and when was it repealed? 1808.

When did St. Louis become a town? 1659.

Who discovered the source of the Mississippi River? 1690.

Who was appointed commander of Florida with orders to plant a Spanish colony, and with what results? 1203.

What was the early postal service of the United States? 1536.

What is the extent of the Postoffice Department? 1537.

What are the duties of the office of Attorney-General? 1985.

Who was founder of Maryland? 1182.

Which was the first state to ratify the Constitution? 517.

What slave state did not secede during the Civil War? 517.

In what state of the Union are the people nicknamed the Blue Hen's Chickens, and why are they so called? 517.

What state has a pillory and whipping-post? 517.

What state's name signifies the Land of Flowers? 683.

How and by whom was Florida discovered? 683.

What is the great corn state of the Union? 935.

What Indian war cost the United States thirty million dollars? 379.

What tribe of Indians owned slaves and fought with the south? 394.

Who were the first people to visit Michigan? 1219.

When was Lincoln's name presented for the vice-presidency by the Illinois delegation at the national Republican convention? 1074.

Who made the first settlement in Alabama? 36.

What was the most important act of Jefferson's administration? 952.

What was the most terrible and destructive battle of the Civil War? 762.

When did Congress adopt the national bank system? 167.

What states have passed laws prohibiting the sale of liquor? 1927.

What was the first settlement after Jamestown? 38.

When was the United States flag adopted? 679.

What was the earliest English settlement in the United States? 959.

Where are the United States mints located? 1238.

What city in the United States is third in importance as to exports? 1330.

Where is the United States Artillery School? 115.

Where is the seat of our Naval Academy, and by whom founded? 74.

What was the character of the first United States postage stamp? 1809.

When and by whom was the first tariff act drawn up in the United States? 1871.

What was the first tariff measure enacted in the United States to protect industries? 1871.

What state passed an act in 1833 declaring the United States tariff-law null? 1785 .

What completed the ruin of the Federal party in the election of 1816? 815.

What was the largest amount ever owed by the United States government? 1305.

When did postal cards come into use? 1537.

When did free mail delivery begin? 1537.

What treaty was made on the spot where Philadelphia now stands? 1446.
What bishop was appointed major-general by Jefferson Davis? 1518.
What territory comprises the Louisiana purchase and what was the consideration? 1119.
When was Louisiana admitted as a state, and what it its area? 1119.
What large concession did Mexico make with the United States in 1848? 1216.

ASIA.

Where is thought to be the cradle of civilization? 119.
What European countries have at different times founded colonies in Asia? 119.
What European countries are now struggling for mastery in Asia? 119.
Who was first to sail around Asia? 1750.
What famous tomb in India is described by travelers as a glimpse of Paradise? 1866.
What was the beginning of the Selucian Empire? 1720.
When was Phœnicia in her greatest power and glory? 1473.
What Assyrian placed the ancient world under one ruler for twenty years? 125.
What city was the center of the world's traffic in the twelfth century? 278.
What country was closed against other nations till 1876? 1011.
Who was the first Assyrian king to invade Egypt? 625.
What first weakened Tyre when at its best? 1963.
What city was the home of Xerxes and Cyrus the Great? 1680.
Who was the greatest king of Babylonia? 153.
What is the most extensive and powerful kingdom in western Asia? 1455.
Who was the real founder of the first Assyrian empire? 125.
At whose death was Turkestan split into fragments? 1955.
From what does Mesopotamia derive its name? 1210.
In what way has an accurate account of the reign of Darius of Persia been obtained? 504.
What evidence have we that the Assyrians reached a high degree of wealth and civlization? 125.

AUSTRALIA.

When did Australia have its beginning as a British settlement? 142.
For what purpose were these early settlements used? 143.
When was Australia found on a geographical chart? 142.
When did the reception of convicts cease? 144.
What gave an impulse to the colony in the early fifties? 142.
When did the government become representative? 142.
When did education come under state control? 143.

INDIA.

The invasion of India by what people brought the Sanskrit language and the Hindu religion? 919-20.
Who was the greatest sovereign India ever had? 920.
What European nations began settlements in India early in the eighteenth century? 920.
When did the British East India Company settle in India? 920.
When and by whom was the first charter granted to the East India Company? 576.
Who was the youngest governor-general ever sent to India? 497.
When did the British East India Company cease to exist? 920
What emperor of India liked to be called Conqueror of the World, and was made a prisoner for life in his own castle? 140.

LITERATURE

ORIENTAL.

What can you tell about the vastness of Chinese literature? 1080.
Are there any others that are as large? 1082.
Who was the greatest and wisest of Chinese? 441.
What has been his influence? 441.
What are the Chinese classics? 1080.
Whose books were used in the Chinese government examinations until a few years ago? 1080.
What are the histories of China? 1080.
Of what are the philosophical and art divisons of the Chinese library composed? 1080.
Of what is the *belles-lettres* division composed? 1080.
Is Chinese poetry an important division of their literature? 1080.
What classes of Chinese literature, though really good, are not included in the national library? 1080.
When was paper first used in printing? 1080.
What is the character of Sanskrit literature? 1080.
What kind of writings are the most important Hindu writings? 1080.
Did the Hindus write any great epic poems? 1080.
What class of Hindu writings is found all over the world? 1080.
What is the rank of Hindu drama as compared to Greek and to English? 1080.
What are the oldest literary documents known? 919.
What literatures were lost for thousands of years and how were they recovered? 125, 152, 1081, 1635, 486, 873, 1082.
How early do we find Babylonian writings? 1080.
What is their nature and how were they written? 1080.
Had the Babylonians any great poems? 1080.
What kinds of books did they write? 1080.
In the ruins of what famous city was Assyrian literature found? 1352.
What was the principal object of the foundation of the Assyrian library? 1081.
What can you tell about this library? 1081.
When was most of it written? 1081.
Which came first: Babylonian or Assyrian? 125, 152, 1081.
Did Assyrian influence Hebrew literature? 1081, 125.
For what are almost all civilized nations indebted to the Phœnicians? 1081.
Who was the Marco Polo of the Phœnicians? 1081.
Where was the key to Assyrian, Babylonian and Persian literature found? 271, 486, 504, 1040, 1352, 1589, 1635.
What is the Zend-Avesta? 1081.
Who is believed to have written it? 2136.
What people use it? 1426.
When did Persian literature flourish most? 1081.
With whom did Persian poetry reach its height? 1081.
Who was the greatest of Persian lyric poets? 1081.
Who wrote the *Rubaiyat?* What does the name mean? 1382.
What is the greatest production of Hebrew literature? 1081, 209.
What sorts of books did its authors write? 209.
Were any Jews historians? orators? philosophers? poets? 209.
What writings by Jewish writers are not included in the Protestant canon of the Bible? 1081.
What are the great translations of the Bible? 209, 759, 970, 1915, 2030, 2114.
Who was the first of modern commentators on the Bible? What influence did he have on the growth of Judaism? 1081.
What great modern philosopher was a Jew? 1799.
Who are some of the modern Jews who have taken prominent rank in literature, science and art? 1082.
What are Egyptian hieroglyphics? 873.
How were they deciphered? 1635.

What is *The Book of the Dead?* 1082.
Who was Egypt's first historian? 591, 1157.
What varieties of literature had the Egyptians? 1082.
How early was the science of medicine known in Egypt? 1082.
Who was Egypt's Homer? What poem the Egyptian Iliad? 1082.
Did the Egyptians write novels? 1082.
What early literature is Christian? 1083.
What was the most important result of Syriac writings? 1083.
What is the oldest book in Syriac in existence? 1083.
How were prize poems in Arabia sometimes written? 1084.
What can you tell about the expansion of Arabian literature in the eighth and ninth centuries? 1084.
What was the condition of Arabia during Europe's dark ages? 1084.
Upon what were Arabian law and theology based? 1084.
In philosophy whom did the Arabians regard highly? 1084.
In mathematics for what are we indebted to the Arabians? 1084.
From what Arabian literature did that of Europe gain much? 1084.
How did the stories of *The Thousand and One Nights* come to be told? 1084.

GREEK.

What are the two great Homeric poems, and what can you tell of them? 1082, 882.
Was Homer the only epic poet of Greece? 870, 1082.
What is the difference between a lyric and an epic poem? 1510.
Who was the greatest Greek lyric poet? 1082, 1491.
What other lyric poets won undying fame? 96, 1678, 1759.
What caused the growth of the drama? 1082, 550.
Who were some of the most important Greek dramatists? 20, 97, 632, 1781.
What tragedian does tradition tell us was killed by an eagle dropping a tortoise, to break its shell, on his bald head, mistaking it for a stone? 20.
Who was the greatest Attic tragedian? 20.
Who is the head of the Greek dramatists? 550.
What Greek dramatist is called the world's greatest laugher? 97.
Who and what was Menander? 550, 1082.
Who were some of the most important Greek historians? 1082.
Which was the father of history? 868.
Which was the philosophical historian? 1908.
Which was the gentleman of leisure? 2117.
Who were the three great Greek philosophers? 1082.
Which one has had great influence on all thinkers since? 1082.
What are the distinctive principles of the teachings of Socrates? 1502
What feature of Greek law caused oratory to become so prominent? 1082.
Who was the greatest of orators? 1082.
Who was the greatest writer of Greek comedies? 97.
What city, founded not long before Demosthenes died, rivaled Athens in literature and scholarship? 45.
What great translation of the Scripture was made there? 972, 209, 1762.
What island contains but three towns of any size, though Vergil told of its hundred cities? 477.
What has made Troy famous to the literary world? 1945.
What made the Greek poet Theocritus famous? 1899.
From what is the language of the Greeks supposed to have been derived? 801.
What caused the decline of Greek literature? 1082.
What was the most famous ancient library? 46.
Where was it? Who founded it? 591.
What story is told about its destruction? 46.
What was Plutarch's professed purpose? 1506.

What important theologian sought to combine the results of Greek philosophy with the gospel during the second century? 1393.
What is meant by the term pseudonym? 1188.
To whom is the world indebted for the first complete edition of Homer?

ROMAN.

When did Roman literature commence? 1083.
Did Rome ever have any really native literature? 1083.
Upon what was Roman drama founded? 1083.
Who were the Roman dramatists? 1083.
By whom and when was the satire founded? 1083.
What is said to have caused the death of Terence? 1891.
In what branches of literature did Rome excel? 1083.
Who was the greatest of all epigrammatists? 1178.
What can you tell of Cicero? 1083.
What noblest Roman of them all was author, orator, scholar, soldier and statesman. 303.
When was the Augustan age of Roman poetry? 1083.
Who were some of the great writers of this age? 1083.
What can you tell of their writings? 1083.
Do any Roman epics compare with those of India and Greece? 1083.
What man of the world is one of the world's lyric poets? 1083.
Who was the chief comic dramatist of Rome? 1503.
Who were the great Roman prose writers? 1083.
Which were historians? Which essayists? Which letter-writers? 1083.
Who was Nero's tutor, and what was his fate? 1723.
What emperor was Plato's philosopher ruling the world? 139.
Who was the earliest and greatest letter-writer in the world? 398.
Who was the last of the great Latin poets? 984.
From whom do we derive our impressions of the life of the upper classes of the first century? 1505.
Who was the real first Roman historian? 1083.
What great writer wrote satires against the rich? 1083.
Who were other Roman writers of a later period? 1083.
What Christian authors glorified the last days of Latin literature? 58, 137, 970.

ITALIAN.

What was the literary language of Europe during the middle ages? 1084.
Who formed a trio of great Italian writers? 1084.
In what country did literature reach its height in its opening? 1084.
What did Dante's *Divine Comedy* do for literature and the Italian language? 501.
Who was the Laura whom Petrarch immortalized? 1462.
What works made Petrarch famous? 1084.
What other great poets are glories of Italy? 96, 1873.
Are there any Italian dramatists? 1084.
What Italian historical product has been translated into most modern languages? 1084.
Who was the foremost Italian of the seventeenth century? 730.
What makes Manzoni's writings valuable literature? 1084.

FRENCH.

Who figure in the oldest literature of France? 1625, 368.
The earliest writings of the French were of what kind? 1085.
What was Provencal? Who were the troubadours? 1944, 1554.
What stirred the literature of France during the sixteenth century? 1085.
Who was known as the jester of France? 1577.
What Frenchman was the first and greatest of essayists? 1254.
What is the greatest collection of printed books in the world? 1422, 1064.
Who wrote *Institute of Christian Religion?* 311.
What French queen was a considerable author? 1170.

For what is the age of Louis XIV noted? 1085.
What Catholic churchmen were great pulpit-orators? 1187.
Who were some of the leading writers of this period? 1085.
What work of this period is precious to Christians? 1085, 1427.
What French scientist and writer founded modern philosophy? 522.
French life under Louis XIV is set forth in what writings? 1085.
What has been the most brilliant period of the Provencal language? 1554.
What were the characteristics of French literature of the eighteenth century? 1085.
What work influenced French thought to a great extent during this period? 1085, 1256.
Who was the queen of letter-writers? 1729.
What can you tell about Voltaire and his influence? 2029.
Who was considered the greatest literary critic of modern times? 1663.
Who was Rousseau? 1638.
What natural history, though not authentic, is considered a French classic? 1085, 286.
What was the leading novel of the eighteenth century? 1085, 1057.
Who was the prince of French orators? 1238.
What romantic idyl was Napoleon's favorite book? 1662.
In the nineteenth century what school arose in French literature? 1085.
Who were the leaders of this school? 1085.
What are some of the writings of the most popular authors of the romantic school? 1085.
Who was considered the greatest French novelist? 1085, 895.
What woman was the George Eliot of French fiction? 1673.
In what department of French literature of the nineteenth century has the greatest work been done? 1085.
Who is the chief French poet of the nineteenth century? 1085.
What other French poet is almost as famous? 1292.
Who are some of the leading nineteenth century historians? 1085.
What French historian set historical study on foot in Europe in the nineteenth century? 813.
Who are the leading philosophers and critics of this century? 1086.
Of whom is it said: "He found French poetry a piece of brick and stucco and left it a palace builded of jewels?" 895.
How did the author of *Monte Cristo* bring himself into disrepute? 560.
Who joked the Provençals and created *Tartarin of Tarascon?* 506.
Who was the earliest French historian? 704.
What notable journalist, although French, wrote in English? 230.

SPANISH.

What is the *Poem of the Cid?* 1086, 398.
What is the best book of chivalry? 56.
How did the Spanish obtain their ballads? 398, 1086.
When were the best Spanish lyrics written? 1086.
What Spanish scholar published the second polyglot Bible? 2118.
What drama is a novel, what novel a drama? 1086.
Who were the lyric poets of Spain? 1086.
Of whom did Byron say: "He laughed Spain's chivalry away"? 361.
What is the best known and best loved of all Spanish books? 1086.
Who were some of the dramatists of the golden age of Cervantes? 1086.
Who wrote nearly two thousand plays? 2007.
When did Spanish literature decline? 1086.
Are any of the best European novels between 1800 and 1900 the work of Spaniards? 1086.
What Spanish orator was a modern Cicero? 347.
What nation has the greatest number of proverbs? 1555.

PORTUGUESE.

What tale of chivalry set European romance agoing? 56.
Who was Portugal's great poet? How did his writings affect the people? 315, 1086.
With whom did the Portuguese literature reach its height? 1086.
What can you tell of the nineteenth century literature of Portugal? 1086.

FINNIC.

What one of the great epics of the world originated in Finland? 1086.
Who discovered it? How did he recover it? 1086.

DUTCH.

Who was the first writer to create a good Dutch prose? 1086.
For what is Vondel noted? 1086.
What was the only book, except the Bible, that for a long time was found in Dutch homes? 1086.
Who were some of the important Dutch writers? 1086.
What Dutchman wrote *Imitatio Christi?* 996.
Which founded international law? 1038, 1086.
Who was the Prince of the Renascence? 623.
What Jewish Dutchman was a great philosopher? 1799.

SCANDINAVIAN.

What is included in Scandanavian literature? 1087.
What do you understand by *Edda?* 1087, 581.
What were the sagas? 1087, 1628.
In what modern literatures do they play a part? 1266, 785, 1606, 1756, 2033, 1347.
What was remarkable about the Icelandic sagas? 1087.
When did the literature of Norway first become of importance? 1087.
What Norwegian was considered one of the great dramatists of his day? 909.
What is the nature of Björnson's writings? 1087, 221.
Who founded the Copenhagen theater, and what were some of his writings? 1087.
What is Denmark's national song? 1087.
Who wrote it? 1087.
What Danish historian revolutionized our ideas as to the first five centuries of Roman history? 1349.
Why do most of us know Hans Christian Andersen? 1087.
Among great critics who is a Dane? 260.
What was the nature of the earliest Swedish writings? 1087.
What great naturalist greatly influenced the literature of Sweden? 1087.
Who was the great theological writer of the eighteenth century? 1087.
What Swedish lady was a famous novelist? 263.
What is the most powerful Swedish novel? 1087.
What epic at once became the most popular poem in Sweden? 1880.

GERMAN.

How far back does German literature date? 1087.
Who were the *Minnesinger?* 1087, 1236.
What two epic poems are considered to be the greatest treasures of German national literature? 1087.
What can you tell of these epics? 1087, 1347.
What great tone-poet used them and the sagas? 2033.
During the fifteenth century what plays rose to their height? 1087, 1238.
Do any of them survive still? 1368.
What famous fable did a German write? 1604.
What fixed the literary language? 1087.
With whom does modern German literature commence? 1087.
Who is called the Luther of German literature, drama and art? 1058.
What German savant almost equaled Newton?

How do German scholars rank with the scholars of the world? 1087.
Who are some of the brilliant philosophers of Germany? 659, 857, 992, 1688.
Who constituted the "ideal" school of philosophy? 659.
What great German philosopher said: "Whoever will tell me of a good action done, him will I thank, though it be the last hour of my life"? 857.
What Scotch philosopher "woke him from dogmatic slumbers"?
Who was Schelling? 1088.
Who are some of the great German historians? 1087.
What German historian lived to be ninety, and wrote about fifty works on history? 1587.
What German historian wrote a Roman history? 1249.
Who was the great scientist of Germany? 897.
Who was Goethe and what can you tell about him? 777.
What English novel influenced Goethe greatly? 2018.
Whose early writings greatly excited the German people? 1087.
How did Goethe and Schiller rank as dramatists? 550.
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What influenced the study of Shakespeare in Germany? 1087, 1689.
What satirist exerted a mighty influence over the German middle classes? 1613.
About 1850 who ranked with Goethe and Schiller? 1087, 858.
Who is the most eminent German novelist? 718.
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CELTIC.

What remarkable people's literature is chiefly known in its French and English forms? 357.
What famous poem from this literature created a sensation in the eighteenth century? 1397.
What was the name of the poets of ancient Britain and Gaul? 554.
What British hero gave rise to much of this literature? 114.
What famous poet was associated with him? 1207.
What noble institution are they said to have founded? 1638.
Who were some of its noted characters? 198, 729, 949, 1035, 1109, 1943.
What did they seek? 790.
How did this literature work its way into French literature? 1628.
What personages of mythology seem to be of Celtic origin? 646, 1129, 1142, 1294, 1559.
Where was Camelot? 314. What was Excalibur? 640.
Who really made the British legends a part of English literature? 1152.
What English poets in modern times wrote about these myths? 1265, 1796, 1856, 1891.
What German wrote musical dramas about Celtic heroes? 1109, 2033.
Who has most nobly and successfully written about them? 1891.
What great poems did he write? 913.

ENGLISH.

When did English literature begin? 201, 618, 190, 302, 47.
Was it written in English? 618.
If not, in what language? 1088.
Who was the first English poet? 201, 302.
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What were some of the literary results of the Normans conquering the English? 618.
When did the first beginnings of our modern language arise? 618.
What one man, more than any other, in effect formed English prose? 2114.
What other man continued and strengthened this literary influence? 1915.

What ancient literatures in the sixteenth century profoundly influenced English? 1081, 209, 1082, 1083.
Who was "the weile of Englishe undefyled"? 373.
What immortal book did he write? 1088.
Did he owe anything to Petrarch and Boccaccio? 373, 1083.
What scientific and philosophical Englishman lived in the thirteenth century? 154.
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What form of poetry grew up in Scotland specially? 161, 1401, 1451.
When did the Renascence appear in England? 1088.
What did the men of the time call it? 706, 1088.
Who are a few of the famous literary men between 1509 and 1563? 1088, 1089.
Who of them is the poet's poet? What famous allegory is his work? 1796, 1088.
What great Englishman wrote about an ideal state? 1261.
When was the Elizabethan age? 607.
What made England then a nest of singing-birds? 1088.
What prince of poets was born in 1564? 1733.
Name a few of his works. 129, 831, 1004, 1130, 1206, 1222, 1399, 1630, 1886, 2097.
What dramatist might have rivaled him? 1174.
What friend of his was "rare Ben"? 978.
Who was "the greatest, wisest, meanest of mankind"? 154.
What interesting and important books did he write? 1089.
To what quaint compiler of travels are we indebted? 825.
What chivalrous courtier of the time wrote a history of the world? 1583.
Had any English novel yet been written? What English romances existed? 1089, 1363, 1628.
How does Milton rank with Shakspere as a poet? 1089.
What were his early poems? 1228.
What was the character of the second period of his writings? 1229.
What was Milton's masterpiece, and during what period of his life was it written? 1089.
Who was the Saxon Milton? 302.
During this period who wrote sermons that were famous in literature? 1876.
Who was the inspired tinker and immortal dreamer? 290.
Who were some other poets of Milton's time? 1089.
Who was the greatest writer of the restoration? 555.
What can you tell about *Absalom and Achitophel?* 1089.
During what period did modern science arise? 1706.
Who were the principal writers along this line? 1089.
What were some of their writings? 1089.
Who was the chief poet of the Queen Anne period, and what were his productions? 1527.
How does the Queen Anne period of literature rank? 1090.
What famous essayists wrote during this period? 12, 626, 1820.
Who was the most forcible prose-writer of this age? 1856.
What were some of his leading writings? 1090.
Who wrote *The Seasons?* 1906.
During this time who wrote a famous elegy and what was it? 797.
Who wrote odes at this time? 425.
Who wrote *Robinson Crusoe?* 515.
What was the first modern novel and who wrote it? 1363.
What was *Tom Jones?* 1090.
For what are Hume and Robertson noted? 897, 1090.
Who wrote *The Decline and Fall of the Roman Empire?* 764.
What were the great names in English philosophy and kindred topics during the Queen Anne period? 1090.
Who wrote *The Wealth of Nations?* 1769.
Who were the two principal essayists of this period? 1090.
Of whom was it said that he adorned everything he touched? 778.

What man is known only as another's biographer? 249.
What can you tell about *The Traveler* and *The Deserted Village?* 778.
Whose poems combine intense passion and wonderful sweetness? 293.
Whose poems are the most musical in the language? 1090.
What was Goldsmith's most popular novel? 1090, 2018.
What friend of Goldsmith made a famous dictionary? 976.
What other friend was a great orator and a master of prose? 291.
Whose poetry greatly influenced later poets? 2109.
What are the most popular of Burns' writings? 293.
What are the general features of the literature of the nineteenth century? 1090.
Who wrote *The Ancient Mariner?* 421.
Who wrote *The Excursion?* 2110.
Who was the poet of Scotch chivalric legends? 1709.
Where was his home? 2.
What were his principal poems and novels? 1709.
Immediately following Scott, what poet became the first of his time? 298.
Who were the poets of brilliant imagination and intense passion? 994, 1738.
Why were not Campbell and Southey appreciated? 1090.
What man and his wife were great poets? 1090.
What poet was called a "soul of fire in a shell of pearl"? 276.
Who is generally considered the greatest English poet of the nineteenth century?
When was *The Edinburg Review* started? 1090.
Who were some of its principal contributors? 274, 336, 522, 1023, 1130, 2092.
Of whom was it said: There go Archimedes, Chesterfield, Demosthenes, Lycurgus, Newton and Solon in one? 274.
Against whom was brought the accusation that omniscience was his *forte* and infallibility his foible? 1130.
What department of English literature took the lead during the century? 1090.
Who were the leading English novelists? 1090.
What great novelist was charged with taking his characters from actual life? 529.
Who wrote *Lucile?* What was his *pen-name?* 1128.
Who are some leading English historians? 1090.
What are some of the important biographies of recent years? 1091
What are the most notable books in politics? 1091.
What are the merits of *The English Men of Letters Series?* 1091.
What names stand among modern essayists? 1091.
What writers have defended theism? 1092.
Who were the leading scientific men of the period? 1091.
What poets have appeared since Tennyson and Browning? 1092.
What biographers of famous men have appeared since 1880? 1091.
Who are some of the leaders in recent *belles-lettres?* 1091, 1092.
Who were prominent in philosophy? 1092.
Name recent historians and their works. 1091.
What effect have Ruskin's views had on English art? 1644.
What famous poem, found almost everywhere, brought the writer only twenty-five dollars for the copyright? 1229.
What Scotch girl was made immortal by the pen of John Brown? 1172.
Who was the greatest writer of sea-stories? 1176.
What book made Thomas More famous? 1996.
Who was the translator of *Ossian?* 1397.
What celebrated author was in debt $700,000 at the age of 55, all of which he paid with his pen? 1709.
Who declined the position of poet-laureate in favor of Southey? 1709.
What book did Dr. Johnson assert to be the first in the world for its knowledge of the human heart? 1611.
Who was called the Father of English Poetry? 374.

Who was styled the Moses of modern science, leading it to the Promised Land, but himself only viewing it from Mount Pisgah? 154.
What was the first encyclopedia? 613.
What was the first book printed in England? 354.
Who was the first English sonneteer? 1851.
What poem is said to contain more familiar quotations than any other of equal length in the English language? 1527.
Who has been called the Father of the English Novel? 1363, 1611.
What led Burns to write his first poem? 294.
What famous poet swam the Hellespont? 298.
What writer received from Elizabeth a grant of thirty millions of acres of American land? 1752.
What writer of the nineteenth century gave up marriage to take care of an afflicted sister? 1023.
Who was the first poet laureate? 1035.
Who are the greatest English letter writers? 1058.
What was the first English printed copy of the New Testament? 1915.
What made Laurence Sterne forever famous? 1824.
What was the wildest and wittiest satire of the eighteenth century? 1856.
What was the first English version of the Bible? 210, 1088, 2114.
What famous novel is the sad life of its author? 272-3.
What made Mrs. Dinah Maria (Mulock) Craik famous? 473.
What was the early life of George Eliot? 606.
What famous author was called a Christian Socialist? 1005.
What Scottish kings have become well-known through Shakspere? 1708.
What made Disraeli's novels popular? 534.
What is *Domesday Book?* 542.
What noted novelist was made baron at the death of his mother? 288.
What clergyman described the loneliness of his parish by saying that he lived 17 miles from a lemon? 1770.
What poet was made poet-laureate in 1813? 1788.
What was Tennyson's first publication? 1891.
When was Tennyson made a peer? 1891.
Who is known as a wit and the creator of Mrs. Partington? 1770.
Who started *The Edinburg Review?* 1770.

AMERICAN.

What was the character of the colonial period of American literature? 1092.
When was the first printing-press set up in Virginia? 1092.
What were some of the early Virginian books? 1092.
What was the first book printed in America north of Mexico? 1092.
In what book are found germs of much of the poetry and romance of Longfellow, Whittier and Hawthorne? 1092.
What can you tell about Cotton Mather and his work? 1092, 1188.
Who wrote *Inquiry into the Freedom of the Human Will?* 588.
Who wrote *Poor Richard's Almanac?* 708.
What other works did the author write? 1092.
What was the character of American literature from the Revolution until 1812? 1093.
Who were some orators? 63, 307, 406, 852, 2062.
Who were the noted essayists and what effect did their writings have? 1093.
Who wrote *The Federalist?* 830, 966.
What are the principal writings of Thomas Paine? 1409.
What was the popular poem of revolutionary times? 1093.
Who wrote *The Hasty Pudding?* 1093.
When was *Yankee Doodle* written? 2120.
Who wrote *Hail Columbia?* 824.
Who wrote *Star Spangled Banner?* 1000, 1813.
Who was the first real American poet and what were his principal works? 1093.

Who was John Woolman? 1093, 1570.
Who wrote *The American Flag* and *The Culprit Fay?* 790.
Who was the first American writer to write works read for their real worth, instead of for the men and times described? 943-4.
When was American literature of real worth first produced? 1093.
Who was the first American novelist of any note? 450.
What were *The Leather Stocking Tales?* 1043.
What beautiful songs, sung in every household, were written at this time? 1094, 883, 1432.
Who was the greatest English-speaking orator? 2062.
Who were the leaders of what was known as transcendentalism? 1094.
What was *The Dial?* 1094.
Who was the great essayist of this period? 612.
Who was the poetic prose-writer about nature? 1906.
Who is the greatest American novelist, and what is his most famous production? 851, 1168.
What books for children did he write? 1098.
What are Longfellow's principal poems? 1094.
What college was a center of American literature at this time? 1094.
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Why is he the most widely read poet of America? 1094.
What first gained Oliver Wendell Holmes notice? 1094.
What work made him known to the whole world? 1094.
What is the character of most of his poetry? 1094.
Who is our greatest critic, as well as one of our leading poets? 1121.
What is considered the finest modern satire? 1094.
Who of our leading historians was almost blind? 1544.
Who has written the best history of the U. S.? 165, 678, 1095.
Who are our leading historians, and what are their principal works? 1094, 1095.
Who were the leading orators of the antislavery cause? 1471, 1847.
Who wrote *Thanatopsis?* 280.
What was the theme of his best works? 1095.
Who was the Quaker poet? 2081.
What were his most popular works? 1095.
Who wrote *The Raven?* 1509.
What other popular works has this author written? 1095.
What American belongs in the same class with Aristophanes and Rabelais as one of the world's colossal laughers? 408.
What translation is considered one of the glories of American literature? 1875, 1876.
What did Thomas B. Read write? 1095, 1589.
Who wrote a noble ode that glorifies Lincoln? 2080.
What book roused America against slavery, and has been translated into over forty languages? 1095, 1834, 1835.
Who are our humorists? 1735, 1829, 2041, 276.
Who wrote *The Luck of Roaring Camp?* 845.
Who wrote *The Hoosier Schoolmaster?* 589.
Who was *Ik Marvel?* 1242.
Who wrote *The Battle Cry of the Republic?* 892.
What plain-people's man made an immortal speech? 1074-5.
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What form of literature has dominated the new era? 1096.
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What characterizes the work of Henry James? 958, 1097.
What style of writer is William Dean Howells? 892, 1097.
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Who was the editor of *The Library of the World's Best Literature?* 2042.

What great orator was called the unagitated agitator? 1471.
How did Samuel Clemens come to take the title of *Mark Twain?* 408.
What poet awoke a desire in Whittier to write? 2081.
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Who was *Peter Parley?* 780.
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What living queen is a famous author? 607.
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What Canadian is one of the greatest writers of historical romance? 1423.
What Canadian's poetry in 1880 won the laurel wreath from the French Academy? 711.
Whom can you name as Canadian historians? 253, 281, 834, 1769.
Who was Sam Slick? 826.
What Canadian clergyman is a popular novelist? 782.
What has Seton the naturalist written? 1727.
Who are some Canadian-born poets? 336.
What Bohemian founded Czech literature? 901.
Who is Poland's best known author? 1753.
What Hungarian was one of the world's great orators? 1012.
What other Hungarians are famous writers? 2000, 1354.
Who first translated the Bible into a Teutonic language? 1964.
What famous writer of the day is a Belgian? 1143.
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What noble Indian translated *Mark* into the Mohawk language? 260.
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When may simple nature-books, histories and biographies first be used? 1099, 876, 1307-9.
Can you name attractive and high-grade books in each of these classes? 1099.
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The English writer who put his own boyhood into his novels. 529.
The story of the sacred tumble bug. 1687.
The king who turned away his daughter penniless. 1004.
The baby king who was nursed by a she-wolf. 1631.
The beautiful youth who gave his life to save the king. 80.
The Greek hero who put out the giant's eye. 1965.
The sorceress who changed twenty young men into swine. 400.
The bold youth who tried to drive his father's chariot and nearly set the earth on fire. 1464.
The king whose body was carried away by fairies. 114.
The beggar who feasted without any food. 172.
The ivory statue that came to life. 1565.
The King of the Golden River. 1003.
The young hero who cut off the head of Medusa the gorgon. 1455, 783.
How Grace Darling saved the shipwrecked sailors. 504.
How a city was built on the ground covered by a bull's hide. 531.
The sea monster who had 12 feet, 6 necks and 6 mouths. 1712.
The cowherd who left the feast because he could not sing. 303.
The goddess who died of grief because her lover left her. 311
The wild men of Thessaly who were half man and halt horse. 359.
The terrible watch-dog with three heads. 360.
The prisoner who made wings for himself to fly across the sea. 495.
The famous knight who asked forgiveness from the pope. 1869.
The king who threw himself into the sea because he thought his son was killed. 1901.
The British officer and the Swamp Fox. 1172.
The boy who was tied to a horse's back. 1193.
The American who refused a title from Queen Victoria. 1433.
The magician who sold his soul to Satan. 651.
The boy inventor who never asked an idle question and never broke a tool he had borrowed. 723.
The dancing countess who lost her garter. 738.
The boys and girls who own a republic. 752.
The Quest of the Holy Grail. 790.
The young girl who was told by a heavenly voice to go to war. 973.

The "Kid Judge" and the boys who robbed the pigeon roost. 1076.
How the emperor's mother made garlands of cornflowers for her children. 686.

METEOROLOGY

With what does this science deal? 1212.
What are included under aerial phenomena? 1212.
What are included under aqueous phenomena? 1212.
What are included under luminous phenomena? 1212.

AERIAL PHENOMENA.

What is a cyclone? 492.
In what direction does the wind travel? 492.
What is the difference between a cyclone and a tornado? 492.
What is an anti-cyclone? 492.
How do the cyclones of the southern hemisphere differ from those of the northern hemisphere? 492.
What is a storm? 1833.
What is the connection between cyclones and storms? 1833.
How does the weather forecaster make his predictions? 1833-4.
What is a blizzard? 1834.
How are winds produced? 2094.
At what rate does a barely perceptible wind move? 2094.
At what rate does a storm blow? 2094.
What is the velocity of a hurricane? 2094.
What are the trade winds? 2094.
What are periodical winds? 2094.
How are the rate and pressure of wind measured? 71.

AQUEOUS PHENOMENA.

Of what are clouds composed? 412.
What are cirrus clouds? 412.
What are cumulus clouds? 413.
What are strata clouds? 413.
What are nimbus clouds? 413.
Why do the clouds not fall upon the earth? 413.
What is the difference between clouds and fogs? 688.
What is the principal source of fog? 688.
What is another frequent source of fog? 488.
What must be present in the air before fog can form? 488.
How is dew formed? 526.
What is the difference between the formation of dew and the deposit of water upon a tumbler? 526.
During what kinds of nights will dew not form? 526.
What is the explanation of these facts? 526.
What is the "dew point"? 526.
What is frost? 720.
What is the difference between the formation of dew and that of frost? 720.
Where are the most remarkable formations of frost seen? 720.
Why is frost more common in country districts than in towns? 721.
What is black frost? 721.
What are the most important causes of rain? 1582.
What are four principles regulating the relation of the winds to rainfall? 1582.
What places are there on the earth where the rain rarely or never falls? 1582.
What effect upon the rainfall have the trade winds in the tropics? 1582.
How may Europe be divided in respect to rainfall? 1582.
What effect have the Rocky Mountains upon the distribution of rain in the United States? 1582.
What is hail? 824.
When do hailstorms occur? 824.

What is the structure of a hailstone? 824.
What is the probable explanation of hailstorms? 824.
What is snow? 1773.
How is snow formed? 1773.
What causes the whiteness of snow? 1773.
What is meant by the "snow line"? 1773.
Why does snow never collect to an indefinitely great depth? 1774.

LUMINOUS PHENOMENA.

Where does the aurora borealis occur? 140.
How does it appear in intermediate latitudes? 140.
How does it appear in higher latitudes? 140.
What makes it seem probable that auroras are produced by electrical discharges? 140.
What sort of a spectrum does the aurora present? 140.
Where are auroral displays most frequent? 140.
What is lightning? 1069.
Who established the connection between electricity and lightning? 1069.
Is the source of electrical charges known? 1069.
What is the rainbow? 1582.
Of what does the rainbow consist? 1582.
What are the two bows called? 1583.
Who first gave the explanation of the rainbow? 1583.
Who completed this explanation? 1583.
What is a mirage? 1239.
What is the cause of a mirage? 1239.
In what different ways does the object appear? 1239.
What is the explanation of this? 1239.
What ship was discovered by means of a mirage? 1239.
What is twilight? 1960.
If there were no atmosphere, what would become of the twilight? 1960.
In the polar regions how long does the twilight last? 1960.
What theories are there as to the matter in the atmosphere that thus reflects the sunlight? 1960.

MINERALOGY

What does the science of mineralogy embrace? 1230.
What parts of the subject are dealt with in physical mineralogy? 1230.
What does chemical mineralogy consider? 1230.
What is shown in descriptive mineralogy? 1230.
When was it that minerals began to be properly studied and classified? 1231.
How were minerals grouped in the system presented by Mohr? 1231.
What methods are now used? 1231.
How do minerals vary in hardness? 1231.
What mineral exhibits different shades of five different colors? 1231.
What are the six systems according to which all crystals, natural and artificial, are classified? 1231.
What is meant by "twinning"? 1231.
What are the four principal ways in which minerals have been formed? 1231.
What is pseudomorphism? 1231.
By what process has petrified wood been formed? 1231.
Where is the topaz found? 1923.
Where is the tourmaline found? 1928.
How did the amethyst get its name? 63.
How are pearls obtained? 1435.
Where are the finest specimens of onyx found? 1168.
Where is the most celebrated opal now found? 1385.
Where is the turquoise mostly found? 1958.
In whose possession are the finest specimens of turquoise supposed to be? 1958.

What charm is the turquoise supposed to have? 1958.
What is the difference between a male and a female sapphire? 1678.
How can a diamond be distinguished? 527.
What famous diamond was found by a negress? 527.
Where was the largest diamond of North America found? 527.
What famous diamond is mounted in the scepter of the Czar of Russia? 527.
Where is the richest diamond mine in the world? 527.
What element in lead and coal is the same that, crystallized, forms the diamond? 332.
What country produces nearly one-half of the zinc of the world? 756.
When and where was the largest gold nugget ever discovered? 162.
Where is the richest copper mine in the world? 452.
What silver region produces one-third of the silver output of the world? 1758.
What state furnishes one-third of the gold, silver, copper and lead mined in the United States? 1254.
What metal expands less by heat than any other? 1502.
What metal will neither tarnish nor rust? 80.
What metal is nine times heavier than water? 452.
Where is sulphur found? 1846.
What is the lightest of all metals? 1537.
What are pyrites? 1566.
What is thallium, when and how discovered? 1897.
What mineral is used to make the Drummond light? 1071.
How is steel produced? 1819.
What has reduced the price of steel very much? 1820.
What metal rusts most easily, and why? 1649.
What is known as Prince's metal? 1644.
What metal is fluid when not heated? 1206.
Where do we find the purest iron ore in America? 1218.
Where are the richest copper mines in the world? 1218-9.
What mines produce one-third of the iron of the United Kingdom? 1222.
How are metals extracted from ores? 1211.
What state yields the most zinc? 1241.
From what is magnesium obtained? 1145.
How were coal beds formed? 749.
What is the extent of the coal fields of the United States? 414.
What is the largest mineral vein in the world? 2025.
Where are the largest manganese mines in the world? 2023.
What is the favorite metal for making casts of statues etc., and how is it prepared? 1598.
What mineral may be woven into cloth? 116.
What gives the prevailing color to granite? 792.
What is the study of shells called? 1738.
How are shells formed? 1737.
Where is the best white sand in the world found? 773.
What is the process of assaying? 122.
What is the process of mining? 1232.
In what various forms do minerals occur? 1232.
What are the more important problems of mining? 1233.

MUSIC AND DRAMA

Who was the father of the modern comic opera? 1372.
Who has been called the singing flower of beauty? 806.
When and where was Mendelssohn born?
At what age did Mendelssohn begin the study of music? 1202.
What is the national hymn of France? 1176.
Where was Mozart born? 1274.
Who wrote *America?* 1770
Who was the great genius of the fifteenth century, and also painted the celebrated picture of The Last Supper? 1056.

What great singer was admitted into the musical conservatories of Stockholm at the age of nine years? 1075.
What singer of renown born in Naples gave instructions in singing to Queen Victoria? 1015.
At what place is the famous miracle play produced every ten years? 1368.
How did Adolph Sax greatly influence military music throughout the world? 1686.
How did Ole Bull lose his large fortune? 287.
What drama did Carlyle call the greatest dramatic work of the eighteenth century? 1689.
What musical instrument is regarded as the ancestor of the piano? 559.
Who was the greatest Italian composer? 1411.
What was the earliest opera, and who was its founder? 1385.
Where did melodrama originate? 1385.
Who is the most famous modern Italian composer? 1385.
When was oratorio first introduced? 1390.
What great tragic actress was queen of the English stage during her time? 1752.
Who holds the first place in London among living actresses? 1893.
What is said to be the birthplace of the drama? 1898.
With whom did quartettes originate? 1571.
For what two great discoveries are pianists indebted to Bach? 153.
What is the national musical instrument of Scotland? 157.
What famous musician was taught to play the harpsichord at the age of four years? 194.
What famous musician became totally deaf? 194.
What is the Stabat Mater? 1807.
When were actresses first allowed on the French and English stage? 1898.
What was the first theater and where was it? 1898.
Where was the first modern theater built? 1898.
Where was the first theater opened in America? 1898.
What is the purpose of religious music? 1284.
What is the test for religious music? 1285.
What contest is going on in church choirs? 1285.
What are the three requirements for effective religious music? 1286.
How may forms in music be classified? 694.
To what does form apply in music? 694.
What is strain? 695.
What are the primary units of thought in music? 696.
What Germans put Germany at the head of the world in music? 153, 194, 834, 852, 1202.
What is a saxhorn and why is it especially fitted for military music? 1685.
Name the three chief classes of opera? 1385.
Who are the five great living women singers? 728, 1355, 1429, 1200, 1705.
What famous singer is called the Queen of Song? 1429.
Who is John Philip Sousa? 1783.
Who was the musical director at the Columbian Exposition? 1905.
What is musical notation? 1288.
Is there a difference between miracle plays and passion plays? 1238.
Who is considered the most eminent of living German musicians? 1837.
What was Wagner's last and greatest opera? 2033.
What is known in music as pitch-representation? 1290.
Give the name of the greatest dramatist next to Shakespeare? 550.
At what early age did Adelina Patti make her first appearance? 1429.
What great living American singer has sung leading parts in 40 operas? 1355.
Who is the greatest living actress and how else gifted? 206.

What modern English actor was knighted in 1895? 943.
What famous musician composed but one opera? 1385.
At what age did Beethoven first show evidences of his genius? 194.

MYTHOLOGY

What goddess is made famous by Swinburne in poetic form? 129.
What goddess is sometimes represented emerging from a golden palace and entering her chariot? 140.
What cruel treatment did Œdipus receive from his father? 1372.
What god became the wisest of gods by drinking from Mimr's fountain? 1472.
What goddess is the muse of history? 1284.
What is said of the muses? 1284.
What hero of the Trojan War slew Antilochus in single combat? 1200-1.
Who is called the early Roman god of war? 1176.
What month was named in honor of Mars? 1176.
How is Morpheus represented? 1264.
What goddess is the muse of comedy? 1284.
What god is forever excluded from paradise? 1452.
What hero won a kingdom by answering a riddle? 1372.
What goddess is the muse of tragedy? 1284.
How did Ulysses escape from the cannibal Polyphemus? 1522.
How did Vertumnus succeed in winning Pomona? 1522.
What goddess is the muse of choral dance and song? 1284.
What god held as sacred the wolf and woodpecker? 1176.
Who is called the Greek sea god? 1320.
Who are called the companions of Apollo? 1284.
What does the word Saturnalia mean? 1683.
What goddess is the muse of hymns? 1284.
How was a vestal virgin treated if she violated her vow? 2017.
What goddess did Apollo teach the secret of prophecy, and because she rejected his love he laid a curse on her? 346.
Who were the Danaides? 500.
Who was Jason? 965.
What divinities are used as denoting the worship of ancestors, the home altar and the hearth? 1031.
What was the hall, where were gathered the dead who had fallen in battle, called? 2035.
What goddess was identified as a personified woman? 983.
Who was the greatest of Egyptian gods? 1396.
What were the Olympic games? 1381.
By what other name was Zeus known? 1682.
Who is the god of the earth in Egyptian mythology? 1396.
Who is the goddess of heaven in Egyptian mythology? 1396.
Who was called the god of heaven? 1899.
What god was called the ruler of earth and heaven in Scandinavian mythology? 1372.
Who was the god of love? 484.
What goddess was spoken of as the twin sister to Apollo? 527.
What goddess was left to die on a hill by her father at her birth because he wished for a son? 129.
What goddess changed Tithonus into a cricket? 140.
What king's son was abandoned by his father and found by a herdsman and raised as his own son? 1372.
What goddess is the muse of lyric poetry? 1284.
How were Neptune and Poseidon represented? 1320.
How was Orpheus killed? 1395.
Who was the goddess of dawn? 1232.
Who was the goddess of the muse of poetry or passion? 1284.
Who was Uranus? 1991.
From what Greek god does our word tantalize come? 1870.
What is said of Saturn in later life? 1682.

What goddess was the muse of astronomy? 1284.
Who were the vestal virgins and how long were they held in service? 2017.
What god ruled the winds, seasons and agriculture? 1906.
Who was Psyche? 1556.
What are the Pleiades? 1504.
When was the festival of Flora held? 683.
What goddess was supposed to have power of restoring the aged to youth? 857.
What goddess when she died was believed to have passed into the star Sirius? 945.
What Roman god was it whose temple was open in time of war and closed in time of peace? 960.
What god is the type of manly strength and manly endurance? 867.
Whose name was changed to Aquarius, and what does it mean? 736.
What river did the Hindoos believe to bathe in her waters will wash away sin; to die and be buried on her banks secures free entry to eternal bliss? 736.
What nymphs in Greek myth are goddesses of trees and woods? 555.
What god made wings for himself and son to escape from imprisonment? 495.
Who was Quirinus? 1631.
What god cut up his brother's body in pieces and scattered them far and wide? 945.
How did Deucalion and Pyrrha repeople the world after the flood? 524.
How did Pythia always appear and what was her office? 518.
What goddess was the daughter of Hyperion? 140.
What god had a banquet for his people every day? 2035.
What goddess was the wife of Saturn? 1682.
Who was called the god of wine? 153.
What heroine was called the swiftest of mortals? 129.
For what crime was Atlas condemned by Zeus to a very great burden? 133.
What is said of Ixion? 951.
Who was called the goddess of the morning? 140.
Who was called the daughter of Atlas? 311.
What famous god was the son of Venus? 487.
Who was the goddess of the moon, and of the flocks and the chase? 527.
Whom did Pindar consider A Sister of the Fates? 700.
What goddess did the Romans claim? 700.
Who was Helen of Troy, and who made her famous by verse? 858.
Who was the goddess of womanhood? 983.
What god was said to be the father of the Roman race? 1176.
What god was called the god of dreams and son of sleep? 1264.
Who was the Roman god of the sea? 1320.
Whose music rocked monsters to sleep and stopped falling cliffs? 1395.
What was a peri? 1452.
What god had only one eye in the center of his forehead? 1522.
What is a sphinx? 1797.
What god was stricken with a fearful thirst and had all things around him to quench thirst, but could not get at them? 1870.
What god devoured all his children at their birth except the last one? 1682.
Who was the Roman goddess of fruits and flowers? 1524.
What nymph did Zeus employ to keep the attention of his wife Hera by talking to her? 579.
Who was the goddess Circe? 400.
Who was Juggernaut? 981.
What is said in Greek mythology about the flood and the ark? 524.
Who was called the goddess mother, the mistress of heaven, the eye of the sun and the queen of the gods? 945.
What is the symbol of the lotus? 1116.

How many times was the gateway of Janus closed in seven hundred years, and what kept it open? 960.
What is the ganga and what does it symbolize? 736.
What god personified the beginning of the arts of sculpture and architecture? 495.
What are dwarfs? 565.
What twin sisters while asleep were touched on the ears by two snakes and purified, so that they could understand the language of birds and thus know the future? 346.
What goddesses were condemned to pour water into sieves in the vain endeavor to fill them, and why condemned? 500.
Who dedicated his oxen and cart to Jupiter and tied the yoke with a hard knot? 781.
What goddess changed men and women into animals with her drugs and charms? 400.
What god avenged Osiris' death? 1396.
Who was Orestes? 1392.
How was Orion killed? 1394.
Who was Hebe? 857.
What are the mermaids? 1208.
Who is the goddess of wisdom? 1232.
Who is Pluto and what is his surname? 1507.
What god was suckled by a she wolf and afterwards brought up by the shepherd Faustulus and his wife? 1631.
Who was the greatest of Grecian deities? 2131.
How can nature worship be traced? 913.
What did the Greeks hold to be ministers of the vengeance of the gods? 842.
What did Hero do against her nymph Echo? 579.
What Roman goddess protects agriculture and the fruits of the earth? 360.
What goddess was Odin's queen? 1372.
How does Homer picture the Centaurs? 359.
What did the goddess Circe do for Ulysses? 400.
Who was the Greek hero of the flood? 524.
What goddess succeeded Hebe as cupbearer to the gods? 736, 857.
How was Isis discovered when she was grieving over the loss of Osiris, her husband? 945.
What are called the twelve labors of Hercules? 867.
What is a vampire? 2001.
What goddess was turned into stone on Mt. Sipylus? 1352.
What three sister goddesses had only one eye among them, and what were they called? 1198.
Who were the Gorgons? 783.
Who was Scylla? 1712.
Who was called the god of thunder? 1906.
Who was the goddess of fire? 2017.
From what god does Thursday get its name? 1906.
What are called Lamias? 2001.
What was Themis the goddess of? 1899.
Who were the father and the mother of Themis? 1899.
Who was Charybdis? 1712.
What god was called Old Man of the Sea? 1553.
What presumptuous youth almost set the earth on fire? 1464.
What famous god was worshiped in Athens by offerings of cows, goats, lambs, milk, honey and wine? 1415.
From what god does Wednesday derive its name? 1372.
What god with his two sons was killed by two serpents that rose from the sea and for what reason? 1029.
What goddess detained Ulysses on her island for seven years and died with grief when he departed? 311-12.
What god never grew weary, and why? 1906.
What goddess was the muse of epic poetry? 1284.
What does the story of Psyche represent to critics? 1556.

Who are called the Seven Stars? 1504.
What god became mad when he realized he had killed his mother? 1393.
Who were the Sirens? 1762.
How was Minerva represented? 1232.
What is said of Pelops? Whose child was he? 1443.
What goddess held sacred the olive branch, the serpent and owl? 1232.
Who was Orion? 1394.
Who was god of the under world, the realm of darkness and ghostly shades? 1507.
What is said of the Titans; who were they? 1916.
What Grecian deity was called the Father of gods and men, protector of kings and supporter of law and order etc? 2131
What was supposed to be the stream of oblivion in the lower world? 1058.
What divinities in Scandinavian mythology personified various elements of evil? 980.
What is an idol? 913.
What did savages use as their idols? 913.
How did Homer make mention of the Harpies? 842.

NATURE STUDY

What is a fine starting point for school work? 1307.
To what do parents pay too little regard in the first five years of a child's life? 1307.
What does nature study include? 1308.
What is the best way to start off with nature study? 1309.
How has the camera helped nature study? 1309.

DOMESTIC ANIMALS.

What is the value of house-pets? 889.
What are the most effective watchdogs? 889.
What are valuable outside watchdogs? 889.
What dog protects poultry from skunks and weasels? 889.
What is a dog's toothbrush? 889.
What makes a dog smell "doggy"? 889.
What will kill fleas on a dog? 889.
What is a cat's medicine? 889.
How many song birds does a cat kill in a year? 889.
What prevents cats from killing mice? 889.
What causes canaries to become diseased? 890.
What is the best seed for canaries? 890.
What causes loss of voice in canaries? 890.
What is the color of the wild canary? 321.
What will red pepper and sponge cake do to wild canaries? 321.
What are the most choice of all canaries? 322.
Why are rabbits and guinea pigs popular? 890.
How often do rabbits breed? 890.
How should rabbits be handled? 890.
How should guinea pigs be treated? 890.
What makes pigeons attractive? 890.
What are the best quarters for pigeons? 890.
Why must each family have a separate home? 890.
How may pigeons be tamed? 890.
How many squabs a year will a pair of pigeons raise? 890.
What was the first animal domesticated by man? 538.
How may dogs become civilized? 539.
What are the chief races of dogs? 539.
What is one of the best sheep dogs? 539.
What dogs are expert swimmers? 539.
How did Robert Bruce escape from bloodhounds? 539.
What is the Great Dane? 539.
What is the common badger-dog? 539.
What hounds have almost lost the power of scent? 539.

What is the most brutal of the dogs? 539.
What is one of the oldest dogs in Great Britain? 539.
In what country is a dog the poor man's horse? 539.
What dog is an irredeemable thief of food? 539.
What are the members of the cat family? 347.
What is the American wild cat called? 348.
What are the best known domestic cats? 348.
What kind of a cat has no tail? 348.
What was said of the black cat in the Middle Ages? 348.
What is the difference between a rabbit and a hare? 1577.
Where were 25,000,000 rabbits killed in a year? 1577.
What is the origin of the name hare-lip? 837.
What are the natural enemies of rabbits and hares? 837.
What immense injury results from the absence of natural enemies? 837
What curious mistake is made about guinea pigs? 812.
What is the turtle dove? 1489.
How did Darwin use pigeons? 1490.
Is the carrier pigeon the one that carries messages? 1490, 341.
Are doves distinct from pigeons? 1490.

BIRDS.

How can bird houses be made cat proof? 1321.
How are birds unlike all other animals? 217.
Did birds ever have teeth? 217.
How many kinds of birds are there in the world? 217.
What is the best way to observe birds? 217.
Name some of the water birds? 217.
To what class do most of the song birds belong? 217.
What kind of a bird is a common chicken? 217.
What are the running birds? 217.
How do the mining birds build their nests? 217.
What bird lays its eggs on the bare ground? 217.
What are the mound building birds? 217.
What bird builds its nest like a baker's oven? 217.
How does the carpenter bird build its nest? 217.
What bird is locked up in its nest while hatching? 218.
What are summer and winter birds of passage? 218.
What man first saw birds of paradise in their native homes? 218.
Does the male or the female have the beautiful feathers? 218.
How many kinds of birds of paradise are there? 218.
What birds are never seen in flocks? 687.
What birds catch insects on the wing? 687.
What bird is unjustly accused of killing many honey bees? 1004.
What bird sings *pewit-phoebe?* 1473.
What bird has a dreamy note of *pee-a-wee?* 1463.
Where does the horned lark live? 1031.
What member of the blackbird family is called a lark? 1194.
Where do 40,000 crows assemble at one time? 482.
What birds does the jay imitate? 966.
Where is the red-winged blackbird found? 222.
What bird is called a locust bird and the ax-bird? 1813.
Are the orioles of the U. S. the same as those of Europe? 1394.
What bird is shot for the table as reed birds? 232.
Where is this bird called the rice bird? 232.
What is the "gladdest bird that sings"? 233.
What bird rides on a cow's back? 469.
What bird has three broods a year? 1791.
What is the American representative of the European kestrel? 1792
What is the bluest bird that flies in North America? 923.
What bird is called the thistle bird and yellow bird? 778.
What bird feeds largely upon rice? 807.
What is the typical bird of the air? 1852.
What bird protects the negro's chicken yard? 1179.
What bird is called a swallow, but is more closely related to the humming bird? 1855.
How does the catbird sing? 349.

What is the most common bird of the South? 1244.
What bird makes a sound like the squeak of a hurt chicken? 1245.
What bird uses its tail in climbing? 476.
What bird can walk on a limb head downward? 1365.
What bird says: "Yank! Yank! Hank! Hank!"? 1366.
How many broods do the bluebirds raise a summer? 231.
What bird devours the eggs and young of other birds? 231.
Is the robin in America the same as in England? 1620.
Where does the robin-redbreast live? 1505.
Can the humming bird be tamed? 898.
Why is the shrike called the butcher bird? 1748.
What birds are included among poultry? 1540.
Why are fowls allowed in the vineyards of France? 1541.
What are the members of the duck family? 557.
What was the parent of our common domestic duck? 557.
Where does she get the down to line her nest? 557.
What duck is called the greenhead? 1152.
What is the difference between the redhead and canvasback? 328.
What is the favorite food of the canvasback? 328.
Where does the duckbill live? 557.
Why is the turkey buzzard protected by law in the South? 297.
What bird robs the osprey? 678.
What bird can put a whole fish in its mouth? 1442.
What bird do the Chinese train for fishing? 456.
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What other thermometer is also used? 1592.
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What is the first law of electrostatics? 596.
What is a "conductor"? 596.
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What are the two kinds of electrification called? 596.

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When iron is heated red hot what is the effect on its magnetism? 1146.
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ANALYTICAL INDEX.

The purpose of the editors in the preparation of *The New Student's Reference Work* has been twofold—to give an accurate, up-to-date, and interesting treatment of all subjects of value to teachers, students, and general readers and to make readily available all such information. To complete the work so well begun in the choice and treatment of subjects and in the general arrangement of facts in the various articles, a complete analytical index has been prepared and will be found at the close of Volume V. The advantage of this Index may be briefly stated as follows:

(1) The selection of the subjects, which should be treated in separate articles, is the first task in the making of a reference work. Where a subject is not treated separately, however, information concerning it may be included in an article on another subject. At once it will be seen that without some means of locating such information much that is of value would be lost to the reader. Here the analytical index comes to his aid. An illustration of this point is found in the subject "Mosques" on Page 2477 of the Index. Here is a word of which the full meaning can be determined from any good dictionary. It is not, therefore, necessary to use space for that. There are, however, some important Mosques, the location of which is of value to the reader. These are all mentioned in other articles. By simply grouping in the Index the pages on which reference to "Mosques" is made all the information desired is obtained, needless repetition avoided, and space economized.

(2) There is a saving of time and needless annoyance by the use of the Index in being able to find the subject desired, irrespective of the title under which it is treated. For example, one may desire the biography of an author, but is only familiar with the pen name. Take for illustration "Marion Harland." In the text on Page 1892 the biography is given under the real name, "Mary Virginia Terhune." The Index, however, gives both names and proper page reference as follows:

Page 2455 of the index, *Harland, Marion,* (Mary Virginia Terhune): 1892.

Page 2505 of the index, Terhune, Mary Virginia (*Marion Harland*): 1892.

Thus one knowing the author under either the pseudonym or real name could find the biography as readily as though both names were known.

(3) An important feature is suggested by the references to "Agriculture," on Page 2414 of the Index. By use of this analytical arrangement one may quickly and with wonderful accuracy formulate a "brief" or an outline of any far-reaching subject such as this, and be fully prepared to take it before the school, to prepare a paper or talk, or to follow a course of reading as the occasion may require. To use "Agriculture" as an example: One would wish to consider first the "History of agriculture," and in that connection "Hebrew agriculture," Medieval agriculture,'" "Modern agriculture," the development of the science in all the various countries named, "experiment stations," "colleges and schools," etc. Next would come soils, and in this connection "alluvium," "capilarity of soils," "chemistry," "distribution of crops," "rotation of crops," "nitro-gathering crops," etc. Next, one would probably want to classify the different branches of farming, as fruit raising referred to in "apples," "grafting," "spraying mixtures," etc.; and stock raising, "poultry," "stock breeding," "stock raising," "stock feeding," "veterinary science;" and dairying, "butter," creamery," "cream separator," Babcock test," etc. The application of this principle to other subjects may be noted, as in the subject "Art," on Page 2418 of the Index.

(4) Noting carefully the foregoing, another advantage is brought into prominence, the ability on the part of the editors, through use of the Index, to condense their work, to eliminate repetition of facts and so classify subjects on which a great diversity of information is given, as to provide space for a number of highly important special articles and make the volumes a compact, convenient and usable library of reference. It may be stated that, in the opinion of the publishers, no such successful work in this line has ever before been undertaken.

It is the urgent advice of the publishers that reference be always made *first* to the Index. Even in finding subjects treated under familiar headings this is good counsel, for with the page in mind one may find the article in a fraction of the time needed to locate it by use of the alphabetical arrangement. When it is remembered that in some cases the subjects will be found not specifically treated in a separate article, in some treated under a title unfamiliar to the reader, and in many cases much added information of value on the subject will be found indicated in additional references, one can appreciate not only the Index as a feature of *The New Student's Reference Work*, but the wisdom of the advice here given.

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The pictures relating to any one subject, in addition to being indexed alphabetically, are also grouped under the subject headings. For example, all the full page illustrations pertaining to Physiology, in addition to being indexed under "Heart," "Brain," etc., are all brought together under "Physiology."

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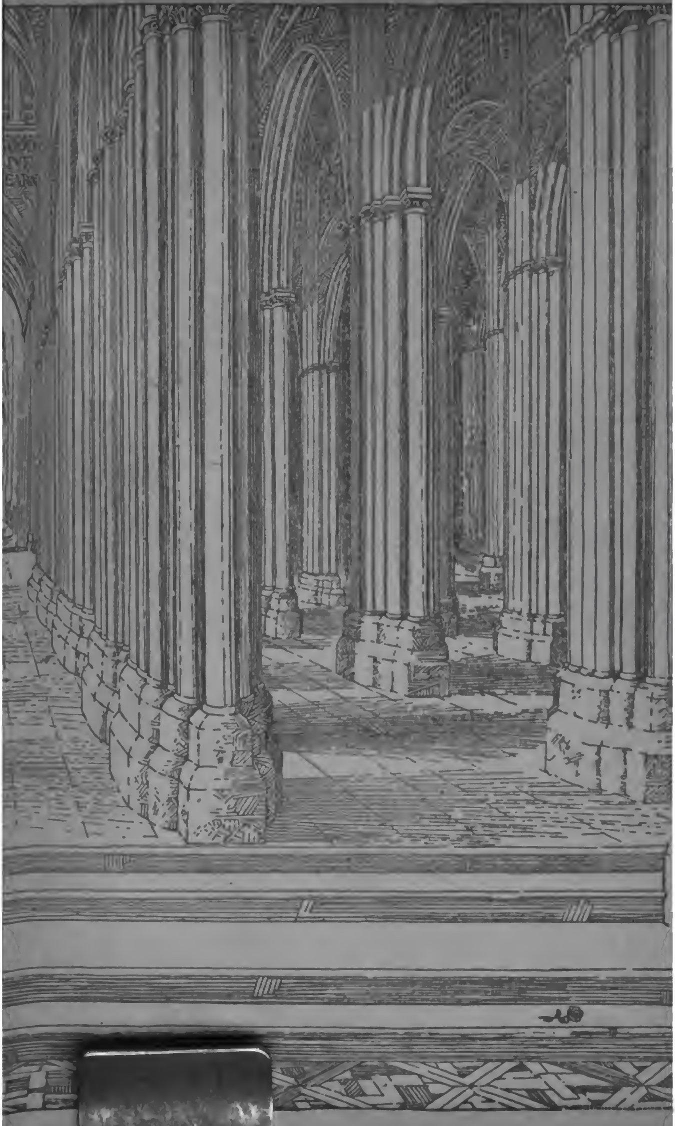

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